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SMITH (C. O.) & COCHRAN (L. C.). **A noninfectious heritable leaf-spot and shot-hole disease of the Beaty Plum.**—*Phytopathology*, xxxiii, 11, pp. 1101–1103, 1 fig., 1943.

For a number of years past, Beaty plums (*Prunus angustifolia varians* × *P. munsoniana*) at the California Citrus Experiment Station have been affected by a leaf spot and shot hole macroscopically indistinguishable from that caused by *Coryneum beijerinckii* [*Clasterosporium carpophilum*], but apparently not of fungal origin, since cultures from the tissues were negative. None of the stocks of various *P.* spp. inoculated with buds from a severely diseased seedling developed the typical symptoms, which appeared after some time, however, on the initial leaves of shoots arising from the introduced material. Scions from the original parent Beaty plum, which had remained free from the trouble, were top-worked on to diseased seedlings, the leaves of which became riddled with holes, while the scion growth was normal. The non-transmissibility of the disorder precludes its inclusion in the virus group of diseases, and that it is a genetical abnormality that segregates among the progeny is regarded as the most likely explanation of its various features.

FISHER (D. V.), BRITTON (J. E.), & O'REILLY (H. J.). **Peach harvesting and storage investigations.**—*Sci. Agric.*, xxiv, 1, pp. 1–15, 3 figs., 1943.

Low temperature breakdown of peach as it occurs in the Okanagan Valley of British Columbia, where a rapid expansion of the peach-growing industry has taken place in recent years, varies somewhat according to the variety and the season. In the early varieties, such as Rochester and Vedette, the fruit tends to become dry, fibrous, and mealy, and in cross section shows a browned, flushed area around the periphery gradually extending inwards. After removal from store the fruit remains rather firm but finally becomes mushy. With late varieties, e.g., J. H. Hale and Elberta, the fruit is firm and attractive in appearance on removal from store but within a few days becomes soft and spongy, discoloured in the flesh, stringy and coarse in texture, and inedible.

In cold storage experiments conducted in 1940 and 1941 at the Summerland Experimental Station [full details of which are given], the varieties Rochester, Golden Jubilee, Vedette, Valiant, Veteran, and J. H. Hale, stored immediately after picking at 32° F., remained free from internal breakdown [*R.A.M.*, xx, p. 539; xxi, p. 85] for two to three weeks in 1940, while Elberta developed symptoms after one week; in 1941, both Elberta and J. H. Hale, held good for only one week, while Vedette and Rochester stored satisfactorily for three and four weeks, respectively. When storage was delayed until the fruit had softened to a pressure of about 10 lb. as measured by the $\frac{7}{16}$ in. point on the Ballauf pressure tester, the breakdown-free life in subsequent cold storage was substantially increased. A delay of one day for mature and two days for immature samples of Golden Jubilee, Rochester, Vedette, and Valiant peaches increased their storage

life by from one to two weeks, while J. H. Hale and Elberta needed a delay of from two to five days to prolong their life for a week.

Storage of Rochester and J. H. Hale peaches in atmospheres containing 7 and 9 per cent. of carbon dioxide at 32° failed to increase storage life, and in the case of Rochester resulted in skin injury.

Brien (R. M.) & Atkinson (J. D.). **The occurrence of Stereum purpureum on the Raspberry in New Zealand.**—*N.Z.J. Sci. Tech.*, A, xxiii, 6, pp. 346–348, 2 figs., 1942.

In December, 1939, C. E. Woodhead and E. E. Chamberlain observed severe infection by *Stereum purpureum* on raspberry plants in the Wairarapa, Nelson, and Canterbury districts, this being apparently the first record of the pathogen on the host in question. On the following 27th June, the authors inoculated six Lloyd George rooted suckers in steam-sterilized soil with potato dextrose agar cultures of the fungus from raspberry, and six with the same organism from a Gravenstein apple, three plants being left untreated as controls. On 13th November, all the original canes inoculated with *S. purpureum* from both hosts were dead, but in three pots of the raspberry and four of the apple series, the new suckers in process of formation were affected by marginal browning of the leaves, defoliation, and in some cases death of the young growth. The surviving plants were transferred to a cool greenhouse, and by 9th January, 1941, typical fructifications of *S. purpureum* had developed at the dead cane bases, whence they gradually spread to the new suckers; at the end of March all the infected plants were dead, while the controls remained healthy.

Tam (E. K.) & Clark (H. E.). **Effect of chloropicrin and other soil disinfectants on the nitrogen nutrition of the Pineapple plant.**—*Soil Sci.*, lvi, 4, pp. 245–261, 4 graphs, 1943.

A full account is given of studies at the Pineapple Research Institute, Hawaii, on the influence of soil disinfection with chloropicrin, steam, and formaldehyde, alone and in combination, on the nitrogen nutrition of the pineapple plant. Root pathogens were of little importance in the reddish-brown lateritic soil used for the experiments, and the results [which are discussed in detail] are interpreted on the basis of the action of the treatments on the nitrification processes and the subsequent effect on the assimilation of nitrogen by the plants.

Microbiological counts extending over a period of 31 weeks revealed a brief initial depression of the soil population in the treated areas, followed by such a rapid multiplication that in three to six weeks the maximum number of organisms present was immensely in excess of those in the control plots. The chloropicrin and formaldehyde treatments favoured the development of *Aspergillus* and *Penicillium* spp., while steam, alone and combined with chloropicrin or formaldehyde, and formaldehyde and chloropicrin together, eliminated nearly all the fungi except *Trichoderma*. The areas fumigated with a combination of steam and chloropicrin yielded exceptionally large numbers of bacteria and Actinomycetes six weeks after treatment, the latter possibly representing a single species with fragile, white, septate mycelia. The plants in these plots were less well-developed, both as regards their root and aerial symptoms, than those given the other treatments.

Dimond (A. E.), Heuberger (J. W.), & Horsfall (J. G.). **A water soluble protectant fungicide with tenacity.**—*Phytopathology*, xxxiii, 11, pp. 1095–1097, 1943.

Promising results in the control of *Diplocarpon rosae* and *Sphaerotheca pannosa* on roses, *Venturia inaequalis* on apple, *Cercospora apii* on celery, and *Pythium ultimum* on pea seeds were given at the Connecticut Agricultural Experiment

Station by a new water-soluble, protective fungicide, disodium ethylene bis-dithiocarbamate, which forms an invisible film on the sprayed surface and is reasonably resistant to weathering, though its tenacity cannot be assessed by the most up-to-date laboratory procedure on account of its anomalous position in respect of LD 50 values [*R.A.M.*, xxii, p. 489].

Kořínek (J.). **Der Einfluss einiger im Pflanzenschutz benützter Spritzstoffe auf die Bodenmikroflora.** [The influence of some spraying materials used in plant protection on the soil microflora.]—*Ann. Acad. tchécosl. Agric.*, xvi, 4, pp. 424–429, 1941. [Czech. Abs. in *Z. PflKrankh.*, liii, 4–7, p. 267, 1943.]

Bordeaux mixture, cuprenox (copper-lime), and a mixture of lead arsenate (arsulmag) and lime-sulphur (vegetan) were applied to the soil of a 20-year-old vineyard in Czechoslovakia with a low bacterial population. Even at a dosage 20 times exceeding those applied in the ordinary course of spraying [primarily against *Plasmopara viticola*: cf. *R.A.M.*, xviii, p. 232], the experimental compounds exerted no detrimental effect on the oligonitrophile and other soil bacteria, nor did they raise the copper content of the soil by more than 0·05 per cent. at the most. In distilled water this concentration of copper may be bactericidal, but not in the soil, at any rate in the presence of detoxicating colloids and organic substances.

Baten (W. D.). & Muncie (J. H.). **A new method for computing Sugar Beet leaf area.**—*Phytopathology*, xxxiii, 11, pp. 1071–1075, 1 graph, 1943.

Recent greenhouse experiments at Michigan State College to determine the effects of copper sprays and dusts on the transpiration rate of sugar beet leaves necessitated the use of a more convenient and expeditious method of computing their area than that afforded by planimeter readings.

Areas of 200 leaves, obtained by the planimeter, were plotted against the widths, the lengths, widths and lengths, and the products of both dimensions. Straight lines were found by the method of least squares for predicting leaf areas from these measurements, and standard errors of estimate and correlation coefficients were calculated in each case. The smallest standard error of estimate was found where the prediction of leaf area was based on the product of width and length. Since the equation for the prediction of leaf areas differs very little for large and small leaves, all the data for both size groups were combined to give one predicting equation, $A = 0{\cdot}7027P$, where A represents foliar area and P the product of width and length: this was used in the construction of a nomogram, which further involved reference to the linear relation between the logarithms of the area, $0{\cdot}7027L$ and W as $\log A = \log 0{\cdot}7027L + \log W$.

The area of a sugar beet leaf with width and length equal to 3·4 and 4·5 in., respectively, is computed from the nomogram by laying a straight edge on the scale of the width axis on 3·4 and on that of the length axis on 4·5 and then reading the area of the leaf, 10·8 sq. in., on the area axis scale. The use of the nomogram permits the simple and rapid estimation of leaf areas in the field or greenhouse without detaching the leaves from the plants.

Guittoneau (G.) & Chevalier (R.). **Sur une nouvelle méthode d'analyse microbiologique des Beurres et sur l'intérêt qu'elle présente au point de vue industriel.** [On a new method of microbiological analysis of Butters and on the interest that it presents from the industrial point of view.]—*C.R. Acad. Sci., Paris*, ccxiv, 11, pp. 581–583, 1942.

An excellent selective medium for the segregation of the various groups of butter

contaminants consists of dilute skim milk-agar, digested by papain and adjusted to a hydrogen-ion concentration of P_H 3·5, at which bacterial development is inhibited in favour of a luxuriant growth of the characteristic mould flora, including *Oidium* [*Oospora*] *lactis*, *Torula*, and *Monilia* spp.

BORLAUG (N. E.). **Resistance of various textile fibres to mildew.**—*Rayon Text. Mon.*, xxiv, 8, pp. 416–418; 9, pp. 475–476, 2 figs., 1943.

The writer's studies on the resistance to mildew of various textile fibres in common use for military purposes [*R.A.M.*, xxiii, p. 71] were conducted at the Du Pont Pest Control Laboratory, Wilmington, Delaware, under the direction of Dr. W. H. Tisdale. The materials included cellulose acetate rayon, viscose process rayon, cotton, nylon, completely saponified (or deacetylated) acetate rayon, nylon transparent film, and Du Pont cellophane. Two methods of evaluation were used, viz., (1) soil burial, in which the test specimens were buried for 21 days in beds containing an active microflora; and (2) laboratory culture tests, involving the storage of the specimens for 14 days at 80° F. and 80 per cent. relative humidity in jars containing a liquid nutrient inoculated with spore suspensions of the experimental fungi, which fell into two groups, (1) active cellulose-destroyers, comprising *Chaetomium globosum*, *Metarrhizium* [*? anisopliae*], and *Stachybotrys papyrogena*, and (2) the superficial moulds *Aspergillus niger* and *Penicillium* sp.

The cellulose acetate and nylon fabrics were found to be highly resistant to fungal deterioration as measured by the soil burial tests, the former retaining 81·2 to 94·7 per cent. of its original strength according to different methods of finishing, etc., and the latter 95 to 96 per cent. In the culture tests, both materials were resistant to the cellulose-destroying fungi, but sustained extensive discoloration by *S. papyrogena*. Skeins of cellulose acetate were stored for seven weeks in the culture room without developing any trace of fungal contamination.

The remaining fabrics listed above were entirely destroyed in the soil burial tests.

HERTZ (M. R.) & LEVINE (M.). **A fungistatic medium for enumeration of yeasts.**—*Food Res.*, vii, 6, pp. 430–441, 5 figs., 1942.

Diphenyl, incorporated into a malt extract agar medium at 100 p.p.m., was found to exert a marked fungistatic action on a number of moulds [cf. *R.A.M.*, xxi, p. 13] for a period of 72 to 96 hours, while permitting the growth of most of the yeasts included in the tests. *Rhizopus nodosus* and *R. nigrificans* [*? nigricans* = *R. stolonifer*] were exceptionally resistant to the chemical, growing vigorously in the presence of 100 p.p.m. and being only slightly inhibited at 500. It has further been successfully used for the reconstitution of bacterial and yeast cultures contaminated by moulds.

JENSEN (H. L.). **Bacteriological use of agar made from Australian seaweed.**—*Aust. J. Sci.*, v, 5, p. 161, 1943.

The spread of the war to the Pacific zone necessitates recourse to home-grown supplies of agar, hitherto produced almost exclusively in Japan, for industrial and scientific purposes [*R.A.M.*, xxii, pp. 445, 491]. Two samples locally prepared from *Gracilaria confervoides* have been used for the culture of pathogenic and saprophytic bacteria, yeasts, and fungi at the Linnean Society of New South Wales, University of Sydney, with highly satisfactory results. A 2 per cent. solution of the agar solidified at a higher temperature (47° to 48° C.) than imported (37° to 38°), and the gel thus obtained was of a particularly elastic structure and therefore very suitable for streaked plates.

Anslow (W. K.), Raistrick (H.), & Smith (G.). **Anti-fungal substances from moulds. Part I. Patulin (anhydro-3-hydroxymethylene tetrahydro-1 : 4-pyrone-2-carboxylic acid), a metabolic product of Penicillium patulum Bainiér and Penicillium expansum (Link) Thom.**—*J. Soc. chem. Ind., Lond.*, lxii, 12, pp. 236–238, 2 figs., 1943.

Patulin, anhydro-3-hydroxymethylene-tetrahydro-1 : 4-pyrone-2-carboxylic acid, previously derived from *Penicillium patulum*, has lately been shown to be obtainable also from various strains of *P. expansum*, isolated from mouldy apples, pears, and grapes. The metabolic product in question completely inhibits the growth of *Pythium de Baryanum*, *P. aphanidermatum*, *P. mamillatum*, and an unidentified *P.* sp. at concentrations of 1 in 400,000 to 1 in 500,000, and partially suppresses the development of these damping-off pathogens at 1 in 1,000,000.

Botjes (J. G. O.). **De invloed van bladrolziekte op de opbrengst van verschillende Aardappelrassen.** [The influence of leaf roll disease on the yield of different Potato varieties.]—*Tijdschr. PlZiekt.*, xlvii, 1, pp. 25–31, 1941. [Abs. in *Z. PflKrankh.*, liii, 4–7, p. 218, 1943.]

In tests on the varietal reaction of potatoes to leaf roll in Holland, Up-to-Date, Wilpo, Eigenheimer, Noordeling, Bintje, and Duivelander were the most resistant to the disease, and Voran, Ultenius, Roode Star, Gloria, Iduna, Bevelander, Magneto, Industrie, Matador, Erstling [Duke of York], Thorbecke, and Paul Krüger [President] the least so. Yield reduction was smallest (0 to 5·3 per cent.) in Up-to-Date and heaviest (84·6) in President. Particular interest attaches to these observations, since the supply of certified seed available for the time being barely suffices to meet the country's demands, but growers can insure against substantial losses by the purchase of commercial stocks of the less susceptible varieties.

Limasset (P.) & Godard (M.). **Nouvelles recherches sur le Phytophthora infestans (Mont.) de Bary.** [New researches on *Phytophthora infestans* (Mont.) de Bary.] —*Ann. Épiphyt.*, N.S., [vii], pp. 145–156, 1941. [Abs. in *Z. PflKrankh.*, liii, 4–7, p. 235, 1943.]

The problem of the influence of age and plant-spacing on the infection of three potato varieties by *Phytophthora infestans* was investigated under strictly controlled conditions at Versailles, Paris, in 1938 and 1939. Young plants were less severely attacked than older ones at and after the flowering stage, but this difference is attributed less to any physiological changes in the host than to the abundance of humidity provided by the dense, serried growth of the older stands, which favours the liberation of conidia and zoospores. The presence of foci of primary infection was shown to be of the first importance in relation to outbreaks of the disease, which was effectively combated by timely applications of Bordeaux mixture.

Rieman (G. H.) & McFarlane (J. S.). **Severe Potato late-blight infection in Sebago tubers.**—*Phytopathology*, xxxiii, 11, pp. 1104–1106, 1 fig., 1943.

In a series of field trials in central Wisconsin in 1941, Sebago potato tubers, normally resistant to late blight (*Phytophthora infestans*) [*R.A.M.*, xx, p. 31] contracted the disease in a severe form, one of the 19 lots examined showing 90 per cent. infection, while among the remainder the incidence ranged from 0 (in one sample only) to 86 per cent. with an average for all lots of 38 per cent. The maximum percentage of rot in a comparable series of Russet Rural samples was 83—quite a normal figure for this variety—and the average 29. Possible reasons for the unusual susceptibility of Sebago may have been the entry of the

pathogen through bruises inflicted at harvesting on the incompletely mature tubers or the development, under the exceptionally favourable conditions for *P. infestans* prevailing over a large part of the growing season, of virulent strains of the fungus capable of attacking a semi-resistant variety [ibid., xvii, p. 482].

Barrus (M. F.) & Müller (A. S.). **An Andean disease of Potato tubers.**—*Phytopathology*, xxxiii, 11, pp. 1086–1089, 1 fig., 1943.

Growing and stored potatoes of the native varieties, Morada and Rosada, in the State of Mérida, Venezuela, were found in 1939 to be affected by a disease known locally as 'buba' (small pustule or small tumour). The affected tubers bore superficial warty excrescences and were misshapen and sometimes cracked. Sections through the cortex revealed the presence to a depth exceeding 1 cm. of subglobose, oval, or irregular rusty-brown or brownish-black cavities, 500 to 1,100 by 300 to 750 (average 764 by 522) μ, the paler and smaller lesions evidently representing an earlier phase of infection than the darker ones. At least 10 per cent. of the tubers in the field under observation, situated about 10,000 ft. above sea-level, were infected by the disease, which was referred by E. V. Abbott in Peru to *Spongospora subterranea* [*R.A.M.*, vii, p. 803]. C. E. Chardon and R. A. Toro [ibid., xiv, p. 397] describe a disease of 'papa criolla' (*Solanum* sp.) tubers, also from Mérida, characterized by wart-like protuberances, which they attribute to *Polysaccopsis hieronymi*. Though agreeing as to symptoms and place of origin, the spore balls of the writers' specimens are not those of a *Polysaccopsis*; they are yellowish-brown, mostly subglobose to ovoid, 16 to 48 by 12 to 28 (28·9 by 22·7) μ, and consist of 2 to 8 united cells, each subglobose to oval but variable and somewhat flattened next to contiguous cells 10 to 16 by 7 to 12 (12·5 by 9·1) μ, enclosed by a brown, verrucose wall, 2 to 4 μ in thickness, each cell also being provided with its own wall, 1 μ thick, and a well-marked nucleus.

A few of the healthy, whole and cut Bliss Triumph tubers grown in pots of artificially infested soil developed typical 'buba' symptoms, whereas the controls remained healthy. The application to Irish Cobbler tubers of fragments of the mycelium arising from spore ball cultures merely resulted in a non-characteristic decay.

The taxonomic position of the pathogen cannot be determined until spore germination is seen.

Snieszko (S. F.) & Bonde (R.). **Studies on the morphology, physiology, serology, longevity, and pathogenicity of Corynebacterium sepedonicum.**—*Phytopathology*, xxxiii, 11, pp. 1032–1044, 9 figs., 1943.

At the Maine Agricultural Experiment Station, a medium ('4-d') consisting of 3 gm. each of bacto peptone, tryptose, yeast extract, and dextrose, and 1 l. water, adjusted to P_H 7, has proved highly satisfactory for the culture of *Corynebacterium sepedonicum*, the agent of potato ring rot. Dextrose may be replaced by maltose ('4-m'), of which the comparatively inexpensive bacto technical brand is quite suitable for routine work, while for stock cultures lactose ('4-m-l') may be substituted for the maltose to the extent of one-third. On the last-named medium the organism continues to make luxuriant growth after six months, whereas only a few viable cells remained in agar slant cultures after six weeks. Other appropriate substrata for stock cultures are milk and litmus milk. Potato and carrot extracts have also given good results in the writers' cultural experiments with *C. sepedonicum*, but care must be taken to maintain the medium at P_H 7 to obviate undue acidity. The new medium (4-m-l plus agar), with the addition of sodium dichromate (1 in 12,000), can be used for the isolation of *C. sepedonicum* from potato tubers with symptoms of soft rot due to secondary infection with *Erwinia carotovora*.

The best sources of carbon for the ring-rot pathogen are the monosaccharides

arabinose, xylose, dextrose, galactose, and levulose, followed by mannitol, their decomposition being accompanied by a slow, and sometimes only temporary, increase in the acidity of the substratum.

Pure cultures of the ring-rot organism, added to sterile loam soil and left buried in the ground, survived from October, 1941, to May, 1942, and retained their virulence [*R.A.M.*, x, p. 52]. On laboratory media, however, *C. sepedonicum* loses its pathogenicity within six months. Infection experiments in which the inoculum consisted of (*a*) macerated ring-rot tubers stored for 13 days before use, and (*b*) tubers badly decayed by *C. sepedonicum* gave negative results.

The ring-rot organism is weakly antigenic for rabbits, producing agglutinating sera with low titre. All strains tested were cross-agglutinated approximately up to the titre of all sera.

Biennial Report of the Rice Experiment Station, Crowley, Louisiana, 1939–1940, 42 pp., [? 1941.]

The following phytopathological problems were studied during the period under review: 'pecky' rice by W. A. Douglas and T. C. Ryker; root rot by T. C. Ryker and W. A. Douglas; and rice diseases in Louisiana in 1939 and 1940 by T. C. Ryker. Of the various fungi tested in greenhouse experiments for their capacity to induce 'peckiness' (hull-spotting and kernel discoloration) in the Early Prolific variety, *Helminthosporium oryzae* [*Ophiobolus miyabeanus*], *Curvularia* spp., *Helicoceras* sp., and *Fusarium moniliforme* [*Gibberella fujikuroi*] were the most active. Extensive discoloration, accompanied by sterility, was also caused by infestation with stinkbugs (*Solubea pugnax*). In 12 fields of Blue Rose, *O. miyabeanus* was responsible for the maximum incidence of 'peckiness', followed by *Trichoconas* sp. and *C.* spp.

Both root maggots (*Lissorhoptrus simplex*) and *Pythium* spp. were found to be associated with root rot, the fungi, however, being also present on apparently healthy plants and presumably assuming a parasitic character only under favourable conditions, notably high soil temperatures, low fertility, and comparatively high alkalinity. The application of a 10–10–0 fertilizer at the rate of 400 lb. per acre to diseased areas in drained fields was uniformly beneficial in 1940, resulting in yield increases of 5·5 to 25·4 bush. per acre (average 12·6).

Head smut (*Tilletia horrida*) is of very sporadic occurrence, mainly affecting the Rexoro variety on new or fertile soil. Its importance lies in the production of an 'off' colour in the milled product by a relatively low percentage of diseased heads.

Besides causing kernel 'peckiness', *O. miyabeanus* attacks the glumes, which constitute a potential source of inoculum in plants used for seed. In experiments in 1938 and 1939 in which lots of cleaned and uncleaned, heavily infected seed were grown in adjacent blocks, in a badly diseased field severe leaf spot developed in both series, but there was practically no seedling blight in either.

The information on *Cercospora oryzae* has been noticed from other sources [*R.A.M.*, xxii, p. 224].

Jensen (H. L.). **Observations on the vegetative growth of Actinomycetes in the soil.**—*Proc. Linn. Soc. N.S.W.*, lxviii, 3–4, pp. 67–71, 2 graphs, 1943.

The microscopic examination, by means of the contact-slide method, of four soil samples, viz., (1) sand-mixed grey loam, P_H 7·7, plus 1 per cent. dry mycelium of *Penicillium*, (2) 'synthetic' soil (sand-kaolin mixture) plus *P.* mycelium, (3) same as (1) plus 1 per cent. hay meal, and (4) red loam, P_H 4, plus hay meal, showed the vegetative development of Actinomycetes to be favoured by a relatively low moisture content and an increase in temperature between 5° and 28° C. No further stimulation of growth occurred at 37°, while at 5° the development of the

organism was negligible. Broadly speaking, therefore, the Actinomycetes, as a group of the soil population, seem to be adapted to a somewhat higher temperature range than the fungi and bacteria, which reach their maxima at 5° to 15°.

REINMUTH (E.). **Weitere Beobachtungen über die parasitäre Blattdürre des Ölmohns.** [Further observations on the parasitic leaf desiccation of the Opium Poppy.]—*Angew. Bot.*, xxv, 3–4, pp. 300–302, 1943.

The work of Ekstrand and other Swedish plant pathologists on the opium poppy [*Papaver somniferum*] disease caused by *Pleospora calvescens*, which had hitherto escaped the writer's notice, is summarized [*R.A.M.*, xxii, p. 39]. Both in Sweden and the Rostock district of Germany, the crop sustained much less damage in the relatively cool season of 1942 than in the exceptionally warm one of 1941. At Rostock the mean temperatures during the critical months of June and July, 1941, exceeded those of the 50-year local mean, whereas in the same period of 1942 they fell below it. A warm spell in August of the latter year was accompanied by a brief renewal of the epidemic, which did not persist, however, when cooler and moister conditions developed, the place of *P. calvescens* being largely taken by various combined infections, including *Fusarium* spp., *Sclerotinia sclerotiorum*, and *Botrytis*.

CROSS (W. E.). **Como obtener maximos rendimientos con las Cañas atacadas por el 'carbon'.** [How to obtain the maximum yields from Canes attacked by 'smut'.]—*Bol. Estac. exp. agríc. Tucumán* 42, 8 pp., 1943.

This is an explanatory discussion of the three chief cultural factors concerned in the procurement of maximum yields from sugar-cane varieties susceptible to smut [*Ustilago scitaminea*] in Argentina [*R.A.M.*, xxii, p. 326], namely, appropriate methods of cultivation, including the precautionary measure of burning the stubble after harvest; provision of adequate humidity, the first irrigation to precede the preparation of the field and later ones to be applied at discretion (e.g., more frequently in sandy than in clay soils); and the use of nitrogenous fertilizers of agricultural origin, e.g., well-aerated farmyard manure, air-dried scum of boiled cane juice, Chile saltpetre, dried blood, meat flour ('tankage'), and cotton, sunflower, groundnut, or castor cakes.

SĂVULESCU (T.). **Die auf Compositen parasitierenden Plasmopara-Arten.** [The *Plasmopara* species parasitizing Compositae.]—*Bull. Acad. roum.*, Sect. sci., xxiv, 1, 23 pp., 1941. [Abs. in *Z. PflKrankh.*, liii, 4–7, p. 238, 1943.]

Besides *Plasmopara halstedii*, hitherto the sole representative of the genus known to attack a number of Compositae, the author found two new species, *P. megasperma* Săvul. on *Scorzonera humilis* (in Rumania only) and *P. sphaerosperma* Săvul. on various subspecies of *Tragopogon dubius* in Rumania, Italy, Czechoslovakia, and Switzerland. The differentiation of the new species is effected on the basis of the shape and size of the conidia and conidiophores. *Bremia lactucae* on *T.* spp., as represented in various herbaria, was found to be identical with *P. sphaerosperma*.

SELMAN (I. W.). **The appearance and spread of mosaic infection in the Tomato crop and the relation to seed transmission of the virus.**—*Ann. appl. Biol.*, xxx, 4, pp. 331–338, 5 figs., 1943.

The results of three experiments, carried out at the Cheshunt Research Station from 1940 to 1942, comparing the reactions of tomato plants raised from virus-free and [tobacco mosaic] virus-infected seed are tabulated and discussed. The experimental plots were distributed at random in a house in which no precautions against entry or spread of virus were taken. In the first two experiments freedom

from mosaic infection was maintained longest in plants raised from virus-free seed, but in the third, carried out in 1942 after steam sterilization of the soil, mosaic infection occurred later in the life of the plants and there were no differences between the two series. The author concludes that there is 'delayed' seed transmission of mosaic-inducing viruses in the tomato crop and that this condition can, as yet, only be interpreted in terms of differences in the resistance of plants raised from seed of different origin to the multiplication and spread of the viruses. Tests made of the virus content of infected tomato seed during germination showed differences in the persistence of virus during germination in seeds of differing origin.

Evidence is also presented to show that, in the second experiment, mosaic symptoms tended to appear first on plants where the depth of top soil was greatest.

Wellman (F. L.). **Comparative toxic effects of extracts from mild and virulent isolates of Tomato-wilt Fusarium.**—*Phytopathology*, xxxiii, 11, pp. 1004–1017, 4 figs., 1 graph, 1943.

Observations were made on the comparative toxicity to excised Bonny Best and Marglobe tomato tops of filtrates from cultures of various ages of mild and virulent strains of the wilt fungus (*Fusarium bulbigenum* var. *lycopersici*) in which the cut ends were immersed. Liquid filtrates from vigorously growing cultures were severely toxic to the leaf blades, petioles, and apical buds, while those from cultures in the incipient stage of 'staling' caused intensive injury of the plant tops, involving stem collapse [*R.A.M.*, xxii, p. 331]. The virulent strain of the fungus produced a considerably larger quantity of toxic material in liquids than the mild one, while the filtrates of the former became highly toxic after a much shorter incubation period than those of the latter, the increase in toxic effect taking place from the 6th to the 12th and from the 11th to past the 30th days of culture, respectively. The toxic effects of 'staled' cultures of either isolate were of approximately equal severity, while protracted ageing (up to a year or longer) in flasks reduced the pathogenicity of both to a comparably low level.

Madhok (M. R.) & Ud-Din (F.). **Bacterial soft rot of Tomatoes caused by a spore forming organism.**—*Indian J. agric. Sci.*, xiii, 2, pp. 129–133, 2 pl., 1943.

In the autumn of 1938, tomato fruits of the large red variety, Pocha and Sons, at the Punjab Agricultural College, Lyallpur, developed a subepidermal soft rot, which spread rapidly, reducing the tissue to a pulp in four to six days. Isolations on beef extract-agar gave rise to a strictly aerobic, Gram-positive bacterium occurring singly in the form of a rod with rounded ends, 1·25 to 2·5 by 0·75 to 1 μ, motile with peritrichic flagella; producing central, ovoid spores, 1·2 by 0·75 μ; liquefying gelatine but not forming indol, reducing nitrate, or hydrolysing starch; evolving acid from sucrose, dextrose, mannite, arabinose, and glycerol, and ammonia from peptone; growth range 10° to 55° C., with an optimum at 40°; the vegetative cells surviving ten minutes at 70° and the spores half-an-hour at boiling point. The organism, which is named *Bacillus frutodestruens* n.sp., produced two types of colony, one dull white and spreading, with an irregular margin, and the other circular, smooth, creamy-white, with an even margin. The results of inoculation experiments showed the bacterium to be a virulent pathogen, the lesions, brownish at first, turning darker and wrinkling and finally disorganizing the whole fruit with the exudation of a malodorous liquid.

Smith (T. E.). **Distribution of bacterial wilt (Bacterium solanacearum) in successive crops of Tobacco grown on the same fields.**—*Phytopathology*, xxxiii, 11, pp. 1076–1080, 1 diag., 1943.

Data from 141 tobacco plots at Oxford, North Carolina, revealed a strong

positive correlation between the incidence of wilt (*Bacterium* [*Xanthomonas*] *solanacearum*) in 1938 or 1940 and that of the disease on the same plots planted to tobacco in 1940 or 1942, infection being usually, but not invariably, more severe on the low-lying areas. The similarity of the pattern of occurrence from year to year suggests that the observed uneven distribution of the disease is correlated with permanent soil conditions rather than with the spread of inoculum by cultural operations or surface water.

MIELKE (J. L.). **White Pine blister rust in western North America.**—*Bull. Sch. For. Yale* 52, 155 pp., 1 fig., 13 maps, 1943. $1.

In his introductory note to this valuable monograph, the author emphasizes the need for further research on some of the unsolved problems relating to the epiphytology of white pine blister rust (*Cronartium ribicola*) [*R.A.M.*, xxii, p. 378], and describes the present contribution as 'a summary of evidence so far obtained on the subject rather than a completed record'.

The pathogen was first observed in western North America at Vancouver, British Columbia, in the autumn of 1921, having been introduced into the locality direct from France in 1910 in a single nursery shipment of eastern white pines (*Pinus strobus*). All the seven species of white pine in the west, viz., *P. monticola*, *P. lambertiana*, *P. albicaulis*, *P. flexilis*, *P. balfouriana*, *P. aristata*, and *P. ayacahuite*, are known to be susceptible to *C. ribicola*, but so far only the first three have contracted natural infection, *P. monticola* being the preferred host of the rust.

About three-quarters of the 60 native species of wild *Ribes* in the western United States and western Canada have been found susceptible to blister rust [ibid., xxii, p. 392], including *R. bracteosum*, *R. divaricatum*, and *R. sanguineum*, prevalent in the white pine section of the coastal belt of British Columbia [ibid., xvii, p. 639], and *R. nevadense* and *R. roezlii* in the Sierra Nevada of California, besides the European black currant (*R. nigrum*), which may still be grown unrestrictedly in British Columbia, though between 1922 and 1927 it had been eradicated from Montana, Idaho, Washington, Oregon, and about two-thirds of California, according to S. N. Wyckoff in his report of the work of the Western White Pine Blister Rust Conference (1927).

In the course of field investigations in 1922–3, circumstantial evidence was obtained of the capacity of the rust to spread from pine to *Ribes* for distances upwards of 100 miles by means of wind-borne aecidiospores, whilst data accumulated during the last 20 years indicated that, under favourable conditions, spread may occur over distances of 300 to 400 miles and possibly further. In this connexion, records of upper-air winds have proved much more valuable than those dealing with surface movements, the direction of which is largely dependent on local topography. With the aid of charts of the upper-air winds it has been possible to forecast with a high degree of accuracy the southward spread of infection to *Ribes* in California. Moisture is a very important contributory factor in the dissemination and intensification of *C. ribicola*, a wide extension of which may be anticipated in any season when wind and humidity combine to favour its development. The spread of rust has been wave-like in character, the waves being irregularly timed owing to the weather and other conditions not being favourable for heavy pine infection locally, with long-distance spread to *Ribes* and the subsequent establishment of the fungus in fresh localities. The years 1917, 1921, 1923, 1927, and 1937 were outstanding in this regard. While the rust has extended more to the south than to the east, the intensity of spread has been heaviest eastward. Black currants are stated to have played only a very minor part in the spread of the rust on pines except in the interior of British Columbia. Spread from pines to *R. nigrum* has not been any further than to susceptible wild species.

Blister rust (*C. occidentale*) of piñon pines (*P. edulis* and *P. monophylla*), the alternate hosts of which are also *R.* spp., notably *R. roezlii* in northern California, is indistinguishable in its uredo and teleuto stages from *C. ribicola* by ordinary methods, but may be readily differentiated in the latter phase by a microchemical colorimetric procedure [ibid., xvii, p. 150].

There is at present no reason to believe in the existence of more than one physiologic race of *C. ribicola*.

Waterman (Alma M.). **Diplodia pinea, the cause of a disease of hard Pines.** - *Phytopathology*, xxxiii, 11, pp. 1018–1031, 1 fig., 1943.

Discussing the taxonomy of *Diplodia pinea*, the agent of a widely distributed disease of hard pines, notably *Pinus nigra*, *P. sylvestris*, and *P. mugo* var. *mughus*, in the United States [*R.A.M.*, xxiii, p. 83], the writer cites a number of illustrations of the existing confusion in the systematic position of the fungus as interpreted by Birch [ibid., xvi, p. 148], Haddow and Newman [ibid., xxi, p. 398], and others. However, since Desmazières's name *Sphaeria pinea*, changed by Kickx to *D. pinea*, antedates the other species mentioned, including *D. megalospora* Berk. & Curt., *Sphaeropsis pinastri* Cke & Ell., *S. ellisii* Sacc., *S. pinicola* Speg., and *D. conigena* Desm., *D. pityophila*, and *D. sapinea*, found by Stevens to have similar spore measurements, it is the preferred designation for the pathogen.

Although *D. pinea* has not yet been observed to cause serious damage in forest plantations, it often assumes a severe form on ornamentals, the killing-back of the current season's growth for several consecutive years resulting in the enfeeblement and sometimes death of the affected trees. The new growth may be attacked in various ways, i.e., by direct infection of the young needles, the elongating shoot, or one bud of a terminal cluster, whence the mycelium migrates into adjacent buds or into the twig, and by the spread of the mycelium from a twig invaded the previous year.

Young (5- to 10-year-old) *P. nigra*, *P. sylvestris*, *P. resinosa*, *P. ponderosa*, and *P. strobus* trees in an experimental plot at Yale University, New Haven, Connecticut, were inoculated with the mycelium or immature fruiting bodies from monospore cultures of *D. pinea* from *P. nigra* and *P. resinosa* on Leonian's synthetic medium [ibid., iii, p. 544]. Positive results were secured on unwounded buds of *P. sylvestris*, *P. resinosa*, and *P. ponderosa*, injured buds of *P. nigra*, *P. sylvestris*, and *P. ponderosa*, undamaged leaves of *P. nigra*, *P. sylvestris*, *P. resinosa*, and *P. ponderosa*, leaf scars of *P. nigra*, *P. sylvestris*, and *P. resinosa*, and twig wounds of *P. nigra*, *P. sylvestris*, and *P. resinosa*. *P. strobus* remained free from attack. These results confirm previous observations as to the capacity of *D. pinea* for the infection of healthy, actively growing bud and foliar tissue, though wounds promote its readier access to the trees.

Davidson (R. W.) & Campbell (W. A.). **Decay in merchantable Black Cherry in the Allegheny National Forest.** - *Phytopathology*, xxxiii, 11, pp. 965–985, 7 figs., 1943.

A tabulated survey is given of investigations to determine the extent of cull caused by wood-rotting fungi in three merchantable black cherry (*Prunus serotina*) stands, of 52, 116, and 120 years old, in the Allegheny National Forest, Pennsylvania [cf. *R.A.M.*, xx, p. 184], of which the first and third were open-grown and the second virtually pure. The incidence of decay in the 52-, 116-, and 120-year-old stands, based on board-foot volume, amounted to 2·3, 11·3, and 6·1 per cent., respectively, the most important butt rots being due to *Polyporus spraguei* (14 isolations from 212 infections), *P. berkeleyi* (9), and *Coniophora cerebella* [*C. puteana*] (8), while the principal agents of trunk infection were *Poria prunicola* (62), *P. mutans* (18), *Fomes pinicola* (32), and *Polyporus sulphureus* (28). Large

branch stubs provided the main source of ingress for the pathogens, except *Poria mutans*, which usually entered the tree through large wounds. *F. pinicola* produced fruit bodies on about half the trees it attacked, but otherwise there was little or no evidence of the wood rots. Besides the organisms already mentioned, the diseased material yielded 10 isolates of *P. sericeo-mollis*, 9 of *Polyporus fibrillosus*, 5 each of *Poria inflata* and *Trametes serialis*, 3 each of *P. cocos* and *Polyporus subcartilagineus*, 2 each of *P. balsameus*, *P. frondosus*, *P. schweinitzii*, *Hydnum* sp., and *Omphalia campanella*, and one each of *Corticium lividum*, *P. fibrillosus*, *P.* [*Polystictus*] *versicolor*, *Poria xantha*, and *Stereum rameale*.

It is concluded that superior-grade black cherry can be grown to large saw-log size without excessive loss from decay by means of judicious silvicultural practices, including the removal of forked trees and the elimination of multiple sprout clumps or their reduction to single stems at an early age.

Grondal (B. L.) & Mottet (A. L.). **Characteristics and significance of white floccose aggregates in the wood of Western Hemlock.**—*For. Cl. Quart.*, xvi, 1, pp. 12–18, 4 figs., 1942–1943.

The presence in the heartwood of water-soaked western hemlock (*Tsuga heterophylla*) logs of small, white, floccose flecks and streaks, known as 'floccosoids', is stated to be responsible for the rejection of substantial quantities of timber of this species as unfit for aircraft construction, since inspectors confuse the defect with the incipient stages of decay by *Trametes* [*Fomes*] *pini* [*R.A.M.*, xxii, p. 187].

Microscopic studies at the College of Forestry, University of Washington, showed the 'floccosoids' to consist of white, pseudo-amorphous or granular deposits in the cell lumina of the tracheids, especially of the spring wood, though the summer wood may also be invaded in the case of larger aggregates. When the wood becomes dry, the 'floccosoids' assume a crystalline aspect, but so far the authors have been unable to reach a conclusion as to their chemical identity.

Negative results were given by tests to determine the possibility of a connexion between infection by *Ganoderma oregonense* [ibid., xix, p. 445] and the occurrence of 'floccosoids', which are believed to exert no adverse effect whatever on the strength of the wood. The following tests are suggested for the differentiation of 'floccosoids' from the white spots due to decay. (1) If the area including the white spot is as firm as the spring wood at either end of the deposit, the latter is a floccosoid: if, on the other hand, the white spot is softer than the spring wood and contains small cavities, it is caused by a wood-destroying fungus. (2) If a very thin sliver of wood from the suspected area is immersed for a few minutes in a 4 per cent. solution of sodium hydroxide, the 'floccosoids' will disappear, whereas white spots due to fungal infection will persist, or the wood in the affected zone will become more transparent than that of the surrounding portion.

Plakidas (A. G.). **Diseases of some vegetable and fruit crops and their control.**—*Bull. La agric. Exp. Sta.* 357, 92 pp., 32 figs., 1943.

This useful handbook comprises much valuable information, accumulated at the Louisiana Agricultural Experiment Station over a period of several years, on the most important parasitic (including virus) and physiological diseases of some vegetable and fruit crops grown in the State, and on their control by cultural measures and spraying or dusting and seed treatments. The bulletin is intended to assist farmers in the fulfilment of the requirements of the food production programme.

Babb (M. F.) & Bohn (G. W.). **Control of soil-borne organisms that cause rots of garden Peas.**—*Phytopathology*, xxxiii, 11, pp. 1098–1100, 1943.

In experiments during the winter of 1941–2 at the Cheyenne (Wyoming)

Horticultural Field Station, good control of the soil-borne fungi (including a virulent Oomycete and a *Fusarium*) causing rots of garden peas [*R.A.M.*, xiv, p. 279] was obtained by treatment of the soil in 2-gal. jars with either 1 l. of a 1 in 50 dilution of 40 per cent. formaldehyde, live steam for six hours, or 2·2 oz. chloropicrin. Seed disinfection with new improved ceresan, semesan, spergon, or red cuprocide gave less satisfactory results. The application of spergon to the seed did not impair the efficiency of the soil treatments, but a combination of the latter with new improved ceresan was deleterious. The good stands derived from untreated seeds in steamed soil and in unsterilized soils from three areas comparatively remote from cultivated land point to the soil as the source of the pathogens rather than the seed.

Person (L. H.) & Chilton (S. J. P.). **Seed and soil treatment for the control of damping-off.**—*Bull. La agric. Exp. Sta.* 349, 16 pp., 1942.

A tabulated account is given of the results of seven years' studies at the Louisiana Agricultural Experiment Station on the control of damping-off (*Rhizoctonia* and *Pythium* spp.) of vegetables and ornamentals in Sharkey (alluvial) and Olivier (upland or terrace) soils. The most effective treatment for tomatoes and bell peppers [*Capsicum annuum* var. *grossum*] was the application to the seed of red or yellow copper oxide (frequently sold under the names of cuprocide and yellow cuprocide) at the rate of 1½ level teaspoonsful per lb. of small seed or ½ teaspoonful per lb. of large, followed if necessary by the sprinkling on the soil surface at emergence of 1¼ oz. (six level teaspoonsful) of either dust per gal. water. The copper oxides are toxic to cabbage, the seed of which should be treated with vasco 4 or zinc oxide (also known as zinc white, paint white, or leafox 200) at a strength of two teaspoonsful per lb. Both substances may also be applied to the soil at emergence through holes in the bottom of a can, allowing 2 oz. per 3 sq. ft. The manufacture of vasco 4 has been temporarily discontinued owing to war priorities. Eggplants should always be given a soil treatment with one of the copper oxides, vasco 4, or zinc oxide in addition to seed disinfection with red or yellow copper oxide. Both the oxides, particularly the yellow, gave good control of damping-off of *Calendula*, *Centaurea*, *Cosmos*, pansy [*Viola tricolor*], *Salvia*, and *Zinnia*.

Rainio (A. J.). **Untersuchungen über Cucumis virus I, Erreger der Kräuselkrankheit auf Gurkenpflanzen.** [Studies on *Cucumis* virus 1, the agent of the crinkle disease of Cucumber plants.] *Valt. Maatalousk. Julk.* 109, 24 pp., 13 figs., 1941. [Finnish, with German translation. Abs. in *Z. PflKrankh.* liii, 4–7, pp. 218–219, 1943.]

The principal features of a disease affecting cucumbers in Finland, namely, the formation of protuberances on the aerial organs, accompanied by arching and crinkling of the leaves and, in extreme cases, by sterility, agree with those described from the United States by Doolittle in 1920 as typical of cucumber mosaic, caused by *Cucumis* virus 1 [cucumber mosaic virus]. Besides aphids, centipedes assist in the spread of infection, which is also carried by the seed and gains ingress through wounds, especially those inflicted with the pruning knife. In dry plant organs the virus retains its viability for a year, both in the greenhouse and in the field. Control measures should include extermination of the insect vectors, removal of suspected plants, disinfection of the pruning knife with 2 per cent. formalin, and the use of healthy seed.

Vasudeva (R. S.) & Lal (T. B.). **A mosaic disease of Bottle Gourd.** *Indian J. agric. Sci.*, xiii, 2, pp. 182–191, 2 figs., 1943.

In May and June, 1941, a widespread infection of bottle gourds (*Lagenaria*

vulgaris) by a systemic mosaic disease was observed in the vicinity of Delhi, the symptoms of which included chlorotic streaks, dark green blisters, appearing as small, convex areas on the upper leaf surface, wavy and irregular outlines, wrinkling, and in some cases regular mottling in the shape of minute, pale and dark green areas all over the leaf blade. The older leaves shrivel and drop in about seven weeks. Plants attacked early in the season remain small, flower sparsely, and set few fruits. Inoculation experiments in insect-proof houses with extracts from diseased plants gave positive results on cucumber, *Momordica charantia*, melon, watermelon, and vegetable marrow.

The bottle gourd mosaic virus, which is named *Cucumis* virus 3, is destroyed by six hours' storage at room temperature, loses its infectivity at a dilution of 1 in 500, and succumbs to ten minutes' exposure to a temperature of 60° C. It does not traverse Chamberland filters of grades L 1 to L 5, and its virulence is greatly reduced by passage through filter paper.

Kligman (A. M.) & Penny (J. S.). **Some miscellaneous diseases of Mushrooms.**—*Phytopathology*, xxxiii, 11, pp. 1090–1093, 1 fig., 1943.

The writers' experiments at the University of Pennsylvania on the inoculation of mushroom beds with *Fusarium solani* var. *martii* and *F. oxysporum*, isolated from pine seedlings, failed to induce in the mushrooms the symptoms attributed to these fungi by F. C. Wood in England [*R.A.M.*, xix, p. 5], and his conclusion that they are responsible for the disease in question is therefore held not to be substantiated.

The results of the authors' investigations on the 'mummy' disease are in essential agreement with those of Tucker and Routien from Missouri [ibid., xxiii, p. 54]. *Pseudomonas fluorescens* was consistently isolated from the greenish-grey slime commonly occupying the discoloured pits, streaks, and channels in the cap and stem tissues, and sometimes occurring in globule form between the gills. Spread of the disease down the bed may be controlled by a trench, 1 ft. wide, across the bed and about 5 ft. in advance of the disease, whilst a 2 per cent. formalin drench was effective in two instances. The same organism was associated, but evidently only in a secondary capacity, with the disease described by W. S. Beach [ibid., xvii, p. 792] as bacterial pit, the true agent of which, however, is believed to be a mite, probably a *Rhizoglyphus*.

Bacterial blotch (*P. tolaasi*) [loc. cit.] is prevalent in the caves of Butler county, Pennsylvania, but attempts to introduce it into the Kennett Square houses were only partially successful, and there is considered to be little risk of its becoming established in the latter area.

Ollram (E.). **Wirkliche und scheinbare Mängel am Rebschnittholz.** [Real and apparent defects on trimmed Vine wood.]—*Dtsch. Weinb.*, xx, pp. 234–235, 6 figs., 1941. [Abs. in *Z. PflKrankh.*, liii, 4–7, p. 266, 1943.]

'Mauke' [crown gall: *Bacterium tumefaciens*] on vines may extend as far upwards as the limits of the ripe wood [*R.A.M.*, xiv, p. 740], where its excrescences, however, are smaller than near soil-level. Although infected trimmings may produce healthy and long-lived stocks, they should preferably be excluded from propagation in order to avoid soil infestation. Situation, soil, and manuring do not in themselves influence the development of 'mauke'. A spurious form of the disease, more prevalent than the real, originates in the cracks made during operations on the foliage, which frequently develop tuberous swellings and become filled with parenchymatous cortical tissue, penetrating right down to the medullary tube. These tissues afford ingress to fungi and sometimes to *Bact. tumefaciens* and gum-secreting bacteria.

Witte (H.). **Redogörelse för verksamheten vid Statens centrala frökontrollanstalt under tiden 1/7/1941–30/6/1942.** [Report on the work of the State Seed Testing Station for the period from 1st July, 1941, to 30th June, 1942.]—*Medd. Frökontrollanst. Stockh., 1943*, 18, pp. 3–68, 4 figs., 1943. [English summary.]

The following are among the items of phytopathological interest in this report [cf. *R.A.M.*, xix, p. 691]. Of the 22,407 samples of cereal seed-grain tested for *Fusarium* infection, 64·9 per cent. were entirely free and only 0·1 per cent. very severely attacked, the corresponding figures for the very slight, slight, fairly severe, and severe, categories being 24·7, 6·7, 3, and 0·6 per cent., respectively. It was estimated that only 7 per cent. of the total number of samples examined were in a condition to require disinfection. A survey of the period from 1934 to 1941 in respect of fusariosis reveals a marked decline in the incidence of infection from 1935 to 1937, followed by a rise in the two succeeding years and another sharp drop in 1940 and more particularly in 1941.

Wheat bunt [*Tilletia caries* and *T. foetida*] occurred in 28·4 per cent. of the 162 winter wheat samples examined, the corresponding figures for the loose smuts of wheat [*Ustilago tritici*] (winter and summer) and barley [*U. nuda*] being 14·8 per cent. out of 162, 34·1 per cent. out of 85, and 84·3 per cent. out of 121, respectively. Out of 460 oats samples inspected, 38 per cent. were free from smut [*U. avenae* and *U. kolleri*]. Stripe disease [*Helminthosporium gramineum*] was present in 67·8 per cent. of the 121 barley samples tested.

Sugar and marrowfat peas were more severely damaged by *Ascochyta pisi* than the boiling varieties, the infection percentages for the three groups being 37, 19, and 7, respectively. Beans were occasionally attacked by *Macrosporium commune* [? *Pleospora herbarum*], which is controllable, however, unlike the foregoing, by seed disinfection with mercurials.

Åkerman (Å.). **Årsberättelse över Sveriges Utsädesförenings verksamhet under år 1942.** [Annual report of the work of the Swedish Seed Association for the year 1942.]—*Sverig. Utsädesfören. Tidskr.*, liii, 3, pp. 117–169, 1 graph, 1943.

The following items of phytopathological interest occur in this report. Winter wheat at Svalöf sustained exceptionally heavy damage from fusariosis [*Fusarium* spp.] and black chaff (*Bacterium translucens* var. *undulosum*) [*Xanthomonas translucens* var. *undulosa*], the latter being particularly severe on the Äring II and III varieties, plots of which showed a dark brown discoloration visible from a considerable distance. The very winter-hardy line Sv 28, 1056 (originating from Halland wheat), which is being extensively used as a parent in new crosses, proved to be virtually immune from black chaff, as also are all the Svalöf-bred winter varieties now available on the market. The same disease occurred in a virulent form on summer wheat, especially on Atle, some local sorts from Halland and Dalarna, and a number of varieties comprised in a large American consignment, including Apex and Renown. Winter wheat in west Norrland and timothy [*Phleum pratense*] in north-west Ångermanland showed profuse infection by *Sclerotinia borealis* [*R.A.M.*, xxii, p. 99], which was likewise observed on winter rye in northern Norrland and Jämtland, experimental grass plots laid down in 1941 also being attacked in the former region: red fescue [*Festuca rubra*] and other species from the south of the country were almost totally destroyed. This pathogen, formerly known only as a relatively innocuous concomitant of *Fusarium nivale* [*Calonectria graminicola*] and *Typhula borealis*, has now assumed an independent and destructive habit.

Six-rowed barley at Svalöf was heavily infected at the beginning of July by *Helminthosporium teres*.

Flax at Svalöf was severely damaged by *Polyspora lini*.

Discoveries and current events. Italy. Plant pathology notes.—*Int. Bull. Pl. Prot.*, xvii, 1, pp. 1M–2M, 1943.

In lemon groves severely affected by 'mal secco' disease (*Deuterophoma tracheiphila*) [*R.A.M.*, xx, p. 398] in Sicily, the Monachello variety of lemon [ibid., xiv, p. 680] is grafted on to bitter orange [*Citrus aurantium*: ibid., xii, p. 565]. Monachello is very suitable for the coarse, shallow soil of the Province of Messina but not for the clay soil of certain other parts of the island. Its resistance to 'mal secco' is high once the plants have attained a certain development, but moderately weak during the first year after grafting. Where it is used, windbreaks should be planted, and fungicidal sprayings carried out in spring and autumn.

Peach trees in Friuli have been killed off by non-parasitic leptonecrosis [ibid., xiv, p. 454]. The conidial stage (*Gloeosporium*) of *Physalospora miyabeana* [ibid., xxi, p. 544], new to Italy, was found on *Salix babylonica* at Busalla, Genoa.

Plant diseases and insect pests. Notes by the Biological Branch.—*J. Dep. Agric. Vict.*, xli, 10, pp. 511–517, 12 figs., 1943.

Target spot or early blight (*Alternaria solani*) [*R.A.M.*, xxii, p. 288] occurs almost everywhere in Victoria where tomatoes are grown. During 1943, serious infection was present in several commercial nurseries, having originated, apparently, in the seed. Starved plants are very susceptible, as may be seen in seedlings allowed to remain too long in seed-boxes or seed-beds before transplanting. Such seedlings generally outgrow infection if treated promptly with a nitrogenous fertilizer. The disease is seldom serious in the field in the chief tomato-growing areas of the State, and its presence is generally an indication of inadequate manuring. As infection develops most rapidly when atmospheric humidity is high and air temperatures are between 75° and 85° F., early and late tomatoes are most susceptible. Spores of the fungus may also gain entry to the fruit through growth cracks, stem scars, or insect punctures causing decay. Heavy losses are sometimes caused in out-of-season tomatoes imported into Victoria from South Australia and Western Australia and kept in the warm, humid, ripening rooms. Such fruit seldom shows decay on arrival.

The following recommendations are made for control. Only firm, healthy fruit should be selected for seed purposes. Old tomato soil should not be used for seed-beds, virgin soil being obtained whenever possible. Affected seedlings should be sprayed as soon as the symptoms are noticed with copper oxychloride (1 oz. to 3 gals. water) or Bordeaux mixture (3-3-40). To obviate damage from heavy droplets of Bordeaux mixture collecting on the topmost leaves, they should be dislodged by a water spray applied as a fine mist. Two or three applications of either chemical are necessary in the seed-bed, the last Bordeaux treatment being applied at least five days before removing the plants to the field. If tomatoes need to be protected in the field, they should be treated with a 7 per cent. copper dust.

Citrus black pit (*Phytomonas* [*Pseudomonas*] *syringae*) [ibid., xxii, p. 133] periodically reaches epidemic proportions in Victoria and was very common there in 1943, when hail and frost injuries were numerous. Control consists in improved orchard sanitation, the provision of windbreaks, the use of thornless varieties, and spraying in autumn and spring with Bordeaux mixture (3–3–50) plus 1 lb. lime casein spreader.

Braun (A. C.). **Studies on tumor inception in the crown-gall disease.**—*Amer. J. Bot.*, xxx, 9, pp. 674–677, 1 fig., 1943.

A study of the period of time required by *Phytomonas* [*Bacterium*] *tumefaciens* [cf. *R.A.M.*, xxiii, p. 8] to change normal host cells to neoplastic cell types showed that by subjecting the host-parasite complex to a temperature of 46° to 47° C.

it was possible to kill the bacterium at any time after it had become established in periwinkle (*Vinca rosea*) plants, though the host was not seriously affected by the treatment. The evidence demonstrated that the change from normal to tumour cells may be induced by the organism as early as 36 to 48 hours after inoculation, though the resulting galls remained very small during the three months' period of the experiment and full expression is not attained until the fourth day. A four-day incubation period resulted in the ultimate formation of tumours in every way comparable to those of the inoculated but unheated controls. The cellular alteration is evidently brought about within four days after inoculation of the host with the organism. The continued abnormal development of the neoplastic cells becomes at this early stage independent of the bacterium. The altered cells then multiply autonomously and develop into large tumorous overgrowths. These results suggest that any attempt to isolate the material that initiates tumour development may be made within four days of inoculation. To explain the difference in the size of galls initiated in this period and those initiated in 36 to 48 hours, it is thought that the bacteria must act for about four days for the altered cells to receive the maximum stimulation.

Rivera (V.). **Action of contact of different metals on the development of neoplasms by 'Bacterium tumefaciens.'**—*Int. Bull. Pl. Prot.*, xvi, 10, pp. 136M-141M, 5 figs., 1942.

Continuing his studies at the University of Perugia, Italy, on the effect of contact with various metals on the agent of crown gall (*Bacterium tumefaciens*) on *Pelargonium zonale* [*R.A.M.*, xvi, p. 399], the writer confirmed the positive results secured in previous experiments, zinc in the form of a sheet inserted into the inoculation wound in particular exerting a strongly inhibitory action on the development of the neoplasms. Copper exercised a similar but less powerful influence on the pathogen, while the initially depressing effect of lead was subsequently replaced by a stimulatory one. This procedure is contrary to that observed in the case of the same metals operating at a distance from the tumours, when lead induces the strongest and most persistent reduction of growth, while zinc and copper are approximately equal in their much weaker action on *Bact. tumefaciens*.

Gallagher (P. H.) & Walsh (T.). **The susceptibility of cereal varieties to manganese deficiency.**—*J. agric. Sci.*, xxxiii, 4, pp. 197-203, 6 figs., 1944.

When different varieties of wheat, barley, rye, and oats were grown in pots in two soils in which oats had previously shown conspicuous symptoms of manganese deficiency [*R.A.M.*, xxii, pp. 130, 428], all these cereals developed disease symptoms, but rapidly recovered when sprayed with a 1 per cent. solution of manganese sulphate [ibid., xxi, p. 193]. Wheat was as seriously affected as oats, but in both cases there were marked differences in varietal susceptibility. Manganese greatly accelerated earing and ripening. It strongly stimulated wheat tillering. The effect of manganese treatment in these respects was in proportion to the severity of the disease symptoms shown by a particular variety. 'Blindness' in oats (reduced percentage of well-filled grain) ran parallel with susceptibility to grey speck. The evidence obtained, taken as a whole, indicated that manganese deficiency in the soil may to a large extent be overcome by the choice of a suitable cereal variety. When symptoms appear, spraying with 1 per cent. manganese sulphate solution provides an effective and economical remedy.

Harris (R. H.) & Knowles (Darline). **Macaroni cooking value of some North Dakota durum Wheat samples.** *Food Res.*, viii, 4, pp. 292-298, 1 graph, 1943.

In further investigations at the North Dakota Agricultural Experiment Station on the relation of wheat blights, including 'black point' [*Alternaria* spp. and

Helminthosporium sativum], to the cooking value of macaroni [*R.A.M.*, xxii, p. 59], the cooked weight and tenderness of the processed product was found to be significantly reduced by the fungal infections. The Kubanka variety is much more resistant to 'black point' than Mindum, the percentage of injury in the former in one series of trials in 1940 being only 5 as compared with 19 in the latter.

Ludwig (R. A.) & Henry (A. W.). **Studies on the microbiology of recontaminated sterilized soil in relation to its infestation with Ophiobolus graminis Sacc.**—*Canad. J. Res.*, Sect. C, xxi, 11, pp. 343–350, 1 pl., 1943.

In pot experiments with steam-sterilized black soil reinoculated with the take-all fungus *Ophiobolus graminis* [*R.A.M.*, xii, p. 18], and inoculated unsterilized soil, less severe infection of wheat seedlings was found to occur in the former than in the latter. It was concluded at that stage of the study that the microflora developing in sterilized soil following recontamination has a greater suppressive action on the take-all fungus than that usually present in unsterilized soil. In further experiments it was found that the two microfloras differ both quantitatively and qualitatively. In general, determination by the plate count method showed that greater numbers of bacteria and fungi and, to a lesser degree, Actinomycetes are present in sterilized recontaminated than in unsterilized soil. *Trichoderma viride* was, in particular, predominant in the sterilized recontaminated soil, while in unsterilized it occurred only occasionally; in natural soils in Alberta, this species is widely prevalent, but not predominant to the extent found in recontaminated sterilized soil. The abundant and rapid development of *T. viride* in the latter is considered to be of special significance, and it is believed that the antagonism of this species towards *O. graminis* probably plays an important part in suppressing the latter.

Garrett (S. D.) & Dennis (R. W. G.). **Note on the occurrence of Ophiobolus graminis Sacc. var. avenae E. M. Turner in Scotland in 1942.**—*Trans. Brit. mycol. Soc.*, xxvi, 3–4, pp. 146–147, 1943.

An extensive search, during 1942, for *Ophiobolus graminis* var. *avenae* [*R.A.M.*, xx, p. 159] in Scotland showed the fungus to be widely distributed in the counties of Ayr, Kincardine, and Aberdeen, and to be present also in Fife and Banff. The fungus was not found in the Lothians or Tweedside, where it was previously recorded by Dennis and Foister [ibid., xxi, p. 439], but crops in these districts were not examined until too late for easy detection of the disease. No search was made in other areas. Measurements made of 50 ascospores selected at random from each of the 21 collections of diseased material obtained in this survey showed the average ascospore length in the different collections to be within the range 96 to 119 μ, and the modal length to vary from 95 to 116 μ. These data are taken to substantiate Miss E. M. Turner's separation of *O. graminis* var. *avenae* from *O. graminis* proper [ibid., xx, p. 159] on the basis of differences in ascospore length as well as in host range. So far the whiteheads disease of oats has not been reported from areas other than those in which oats are the chief cereal crop. The association of the disease with consecutive oat cropping was noted by the authors in Ayr, where it is the practice to take two, and occasionally three consecutive crops of oats after ploughing up old grass. Oats infected by *O. graminis* var. *avenae* (mean ascospore length $112 \pm 1{\cdot}2\ \mu$) were discovered at Craibstone, Aberdeen, but wheat suffering from the take-all disease on another field of the same farm yielded *O. graminis* proper (mean ascospore length $71 \pm 1{\cdot}1\ \mu$). It is suggested that a careful search for *O. graminis* var. *avenae* should now be undertaken in the south and east of England and ascospore measurements made on collections of wheat and barley attacked by the take-all disease in Scotland, Wales, and the north-west of

England, with a view to establishing the susceptibility of these crops to the oats fungus in the field.

Patel (N. B.). **Independence in inheritance of the loose smut reaction and lemma colouration in an Oat cross.**—*Bull. Inst. Agric., Anand, India*, Bot. Ser., 1, 27 pp., 1943.

A detailed, tabulated account is given of the writer's studies at Ithaca, New York, on the mode of inheritance of the characters for loose smut (*Ustilago avenae*) reaction and lemma coloration in crosses between the highly susceptible Victor (*Avena sativa*) and the very resistant Victoria (*A. byzantina*) oats, the two varieties being furnished with black and red glumes, respectively. The kernels of the dehulled seeds were inoculated with chlamydospores of physiologic race 21 of the pathogen. The F_1 progeny were resistant to smut and their spikelets were black. In the F_2, 257 plants were classed as non-susceptible, black-glumed, 102 as non-susceptible, non-black-glumed, and 107 as susceptible only (the glumes in the last-named group having been destroyed by the smut and their colour therefore indistinguishable). These observations agree with a 9: 3: 4 ratio postulated by the hypothesis that smut reaction and lemma colour are independently inherited, i.e., there is no genetic linkage between the two characters. The genes conferring resistance to *U. avenae* and black glume colour are dominant over those for susceptibility and red lemmae, this conclusion being amply corroborated by the behaviour of the F_3 offspring of the cross.

The discussion appended to the paper includes references to the nature of disease resistance in plants, the cellular or protoplasmic type of immunity, the cytology and development of *U. avenae* within the host, varietal reaction and its classification, the mechanism of disease resistance in plants, and the inter-relationship of polymerism and hexaploidy in oats.

Richter (H.) & Müller (H.). **Der Brand der Rispenhirse (Sphacelotheca panici miliacei) und seine Bekämpfung.** [The smut of Panicle Millet (*Sphacelotheca panici-miliacei*) and its control.]—*Zbl. Bakt.*, Abt. 2, cvi, 1–4, pp. 32–37, 3 figs., 1943.

The cultivation of panicle millet (*Panicum miliaceum*) had for many years before the present crisis been practically abandoned, but it has recently been resumed in connexion with the plan for German economic self-sufficiency, in this case with special reference to fodders. The symptoms of smut (*Sphacelotheca panici-miliacei*), which has been observed to be steadily increasing with the expansion of its host, are described on the basis of the relevant literature, the titles of 32 papers being cited in the bibliography. Experiments were carried out at the Biological Institute, Dahlem, Berlin, to determine the efficacy of seed treatment in the control of the smut, two methods of inoculation with which were used, namely, (1) immersion of the seed in a 0·4 per cent. spore suspension, and (2) contamination of the soil of the seed drills with a mixture of spores and talc, resulting in 60 and 47 per cent. infection, respectively. Perfect freedom from smut was obtained by dusting with the officially approved fungicides, abavit, ceresan, germisan, and fusariol, at dosages of 300 or 400 gm. per kg. seed, while the 200 and 100 gm. rates permitted the development of a few infected panicles. Satisfactory results were also given by three forms of liquid treatment with the same preparations, viz., 30 minutes' immersion at 0·1 or 0·2 per cent., sprinkling with 15 l. of a 0·5 per cent. solution per 100 kg. and covering for one hour, and the short disinfection process at a strength of 1, 2, or 3 per cent. per 100 kg.

Smith (M. R.). **The relationship of ants and other organisms to certain scale insects on Coffee in Porto Rico.**—*J. Agric. P.R.*, xxvi, 2, pp. 21–27, 1942.

The principal factor regulating the abundance of scale insects on coffee in Puerto

Rico, of which the most important are *Saissetia hemispherica* and *Coccus viridis*, is the development on the pests of certain entomogenous fungi, especially *Cephalosporium lecanii*. These organisms flourish in the presence of shade, coolness, and humidity, and the incidence of scale infestation is accordingly reduced in well-shaded groves. On the other hand, the insects abound during dry spells, or when the shade trees are stripped of their branches, as in the San Felippe hurricane of 1928, thereby permitting the access of sunlight to the coffee.

Negroni (P.). **Sobre el Paecilomyces burci (Pollacci) Thom como probable hongo entomógeno de la Mariposa.** [On *Paecilomyces burci* (Pollacci) Thom as a probable entomogenous fungus of the Butterfly.] *Rev. Inst. bact., B. Aires*, xi, 3, pp. 265–267, 2 pl., 1943. [French and English summaries.]

A dead pupa of a butterfly from Lomas de Zamora, Buenos Aires, was covered with the white coremia, 4 to 5 by 0·4 to 0·5 mm., of a fungus, which was cultured on Czapek's agar and identified on the basis of its sterigmata, 5·2 to 15·1 by 1·8 to 3 μ, as *Paecilomyces burci* (Pollacci) Thom. The conidiophores are 2·2 to 3 μ in diameter and the elliptical, concatenate conidia 4·5 to 7·5 by 3 μ. Attention is further drawn to the claviform, slightly arcuate, relatively thick-walled, pigmented, pedunculate, vegetative organs, separated by a septum from the rest of the mycelium, the function of which is obscure. On the above-mentioned medium the colonies after 15 days at 25° C. measure 2·5 cm. in diameter; they are plicate, pubescent, some zonate and fleecy, others chamois-coloured, the reverse side being plicate and of an orange tint. On beer wort agar the growth is fleecy, chamois-coloured at the centre and white at the periphery, the reverse side as on Czapek's.

Melville (R.) & Dade (H. A.). **Chalk brood attacking a wild Bee.** *Nature, Lond.*, cliii, 3873, p. 112, 1944.

In the nest of a leaf-cutting bee, probably a species of *Megachile*, in a piece of deal from Acton, the pupa and pollen store were found to contain *Pericystis apis*, the pathogen causing the chalk brood disease of honey bees [*R.A.M.*, ix, p. 524]. There does not appear to be a previous record of this fungus on wild bees.

Stuhr (E. T.), Christensen (B. E.), & Wong (E.). **Assay of Oregon ergot.**—*J. Amer. pharm. Ass.*, Sci. Ed., xxxii, 9, pp. 241–244, 2 figs., 1943.

Existing world conditions have necessitated the investigation of potential sources of ergot (*Claviceps purpurea*) supply within the United States. The fungus is commonly present on grasses in the range land of south-eastern Oregon, the extent of infestation, however, fluctuating from one year to the next. In 1940 and 1941 the disease was prevalent on the giant wild rye [*Elymus condensatus*], blue joint [*Calamagrostis canadensis*], and Nevada blue [*Poa nevadensis*] grasses in Harney County. The samples assayed by colorimetric and biological methods induced typical physiological reactions, while the fluid extract possessed a strong potency.

Colhoun (J.). **Grey mould (Botrytis cinerea) of Flax.** *Nature, Lond.*, cliii, 3870, pp. 25–26, 1944.

When clean flax seed was dipped in a spore suspension of *Botrytis cinerea* from flax seed, and the inoculated seed was placed in pots of moist, sterilized soil covered with bell jars, a few days after the cotyledons had appeared, some of the seedlings showed brownish lesions on the hypocotyl and afterwards developed damping-off. Seedlings from uninoculated seed remained healthy, provided the bell jars were not removed.

Seed treatment with nomersan [*R.A.M.*, xxii, p. 359] at the rate of 12 oz. per cwt., or with ceresan U564, using an 8 per cent. solution at the rate of 0·9 gal. per cwt., reduced contamination with viable *B. cinerea* from 15 per cent. in the control to 0·4 and 1·4 per cent., respectively, in 1942, and from 13·1 per cent. to 1·2 and 1·6 per cent., respectively, in 1943.

In pot experiments in a greenhouse and under an open outdoor verandah very satisfactory control of the disease resulted from the use of nomersan and ceresan U564. In field tests, similar results were obtained, though in the trials made in 1942 the disease was early checked by cold, dry weather, whilst in 1943 it did not appear, owing probably to the cold weather following sowing.

Observations in the field showed that *B. cinerea* is able to kill portions of the stems of mature plants; it is, also, often present on the stems and capsules if long periods of damp weather occur after the crop has been pulled.

HAWKER (LILIAN E.). **Notes on basal rot of Narcissus. I. A comparison of various methods of using formalin in connection with the hot-water treatment against Eelworm. II. Infection of bulbs through dying roots in summer.** *Ann. appl. Biol.*, xxx, 4, pp. 323–324, 325–326, 1943.

In three years' large-scale experiments to determine the best method of using formalin (against *Fusarium bulbigenum*) [*R.A.M.*, xix, p. 539; xxi, p. 335; xxii, p. 169] in the hot-water treatment of narcissus bulbs, it was found that the bulbs infected with *F. bulbigenum* showed equally good control whether formalin (0·5 per cent.) was used in the bath (three hours at 42° to 43° C.) or as a cold or warm steep immediately afterwards. For example, in one lot of 140 Victoria bulbs given the hot water treatment 85 rotted, whereas only two rotted when formalin was added to the bath, and only four when cold formalin steep followed immediately on the hot-water treatment; in another test with 80 Victoria bulbs, the corresponding figures were 57, 10, and 7, while in one with 50 Golden Spur they were 5, 0, and 0, respectively. Delayed formalin treatment gave less control in four out of five trials.

No damage to leaves or flowers was caused by any treatment applied in late August, the period of maximum dormancy. In the one experiment (Seagull variety) in which bulbs were treated at other times, treatment in July caused roughening of the leaf surface, splitting of the flowers, and accelerated flowering, while treatment in September resulted in blind buds. This injury was caused by the hot-water treatment, and was independent of the use of formalin.

In experiments with about 5,000 healthy bulbs belonging to six varieties, no treatment had any significant effect on either average date of flowering or amount of gain in weight during the next growing season. It is concluded that formalin may be added directly to the hot-water bath or used as a warm or cold steep immediately after with equally good results, but losses from basal rot may ensue if the formalin treatment is delayed.

When the roots of the susceptible varieties Spring Glory, Victoria, and Golden Spur were exposed in May or June and a culture of *F. bulbigenum* was scattered over them and the soil then replaced, a high percentage of infection followed only when the soil was wet at and after the time of inoculation. Cool weather delayed infection. Bulbs planted during autumn in experimentally or naturally infected soil gave a complete stand in spring, but later developed heavy losses from basal rot. In the author's experience, infection of a clean stock from the soil arises only when an affected stock was grown in the same plot before, or when the soil has been artificially contaminated. If the fungus is, in fact, a soil inhabitant, then under English conditions, either it is not present everywhere, or, if it is, it is present only in small amounts.

Hawker (Lilian E.) & Singh (B.). **A disease of Lilies caused by Fusarium bulbigenum Cooke & Mass.**—*Trans. Brit. mycol. Soc.*, xxvi, 3–4, pp. 116–126, 1943.

A disease of lilies, causing serious losses, was observed during 1939 on seedlings of *Lilium auratum*, *L. sargentiae*, *L. nobilissimum*, *L. regale*, and on bulbs of a hybrid lily. The first symptom is a slight wilting of the leaves and a reddish-brown root rot usually beginning at the tips; later leaves become yellow and stunted, the roots decay entirely, the rot spreading into the bulb scales, the outer ones being attacked first. Diseased areas are clearly demarcated from healthy ones, the lower portions of the scales being completely rotted while the upper ones remain white, though some bulbs are wholly rotted. Isolations from diseased tissue yielded a fungus identified as *Fusarium bulbigenum*, the identification being confirmed by Miss E. M. Wakefield. The organism resembled the strain isolated from *Narcissus* bulbs with basal rot [*R.A.M.*, xix, p. 539]. Inoculation experiments demonstrated that the fungus is capable of infecting unwounded roots of *L. regale* and of seedling lilies, but not unwounded bulb scales. The strain from *Narcissus* caused infection of wounded bulb scales, but the rotting was slower than that caused by the strain from lily. Inoculation of autoclaved soil with infested soil from the vicinity of diseased seedlings or with sand or maize meal cultures of the lily strain of the fungus resulted in a high incidence of both pre- and post-emergence damping-off of lily seedlings, while the strain from *Narcissus* caused less heavy losses. Old isolations of the lily strain were less virulent than fresh ones. Infection and losses were also caused by watering the seed boxes with a suspension of spores of *F. bulbigenum*. Good but not complete control was achieved by adding formalin dust (0·5 per cent. by weight) to the soil in seed boxes before sowing, and some protection resulted from treating the soil in frames with liquid formalin before planting, or watering the growing seedlings with a weak solution of uspulun.

Louw (A. J.). **Mottle leaf or mosaic chlorosis of Apples.**—*Fmg S. Afr.*, xix, 214, pp. 32–34, 44, 1 fig., 1944.

Apple trees in South Africa have for many years past been subject to a mottle leaf or mosaic type of chlorosis, which appears to be spreading. In a preliminary survey carried out in Ceres and Elgin, no apple orchard was found to be entirely unaffected, and in every orchard examined nearly all trees of the Golden Delicious variety were attacked.

The most conspicuous symptom is the presence of numerous blotches on the leaves. In spring and early summer, the blotches are white, while on leaves developing in late autumn they are often yellow. Sometimes, the greater part of the leaf is white, with a narrow band of green adjoining the larger veins; in other areas, chlorosis is present only along the larger veins, while the rest of the leaf remains green. In some leaves, only the serrated border is chlorotic. In summer, the chlorotic blotches tend to dry out, after which the leaves drop, severely affected trees becoming almost completely defoliated by midsummer. All the leaves on a shoot may bear blotches, but as a rule normal leaves are found among affected ones on the same shoot. No symptoms are present on the fruit.

The condition was not found to be associated with nutrient deficiencies. It was readily transmitted by grafting or budding. When healthy trees are grafted or budded with diseased material, typical mosaic leaves develop on the rootstock, even when the infected bud is not allowed to run out. The disease is also transmitted by buds from the axils of the apparently healthy leaves from affected trees, as well as by grafting bark strips from affected trees on to healthy ones. The initial movement of the virus appears to be towards the roots.

The condition was experimentally transmitted to the varieties Apple of Commerce, Cleopatra, Golden Delicious, Granny Smith, Ohenimuri, Red Delicious, Rokewood, Rome Beauty, Versveld, and White Winter Pearmain. Preliminary observations suggest that the virus is spreading most rapidly in Golden Delicious, Ohenimuri, and White Winter Pearmain.

In old orchards, severely affected trees are frequently lacking in vigour and produce small crops of poor fruit. While it is not feasible to destroy affected trees, the prevalence of the disease will be much reduced if only trees free from mosaic are used for new plantings. Budwood and scions must not be taken from affected trees, and nurseries practising root-grafting should take the same precautions in selecting root-grafts. Where stub-grafting is applied, the likelihood of infection is greatly increased. Growers who intend to buy trees for new plantings should inspect the nursery during the summer, when the trees are still in full leaf.

Jauch (Clotilde). **La presencia de 'Cylindrocladium scoparium' en la Argentina.** [The presence of *Cylindrocladium scoparium* in Argentina.]—*Rev. argent. Agron.*, x, 4, pp. 355–360, 2 pl., 2 figs., 1943. [English summary.]

Cylindrocladium scoparium has recently been observed to attack apricots, yerba-mate [*Ilex paraguayensis*], on which the first collection was made by J. B. Marchionatto, *Eucalyptus* [*R.A.M.*, xxii, p. 505], and roses in various parts of Argentina. The fungus produces on apricot stems, at or just below soil-level, necrotic lesions which rapidly girdle the infected part and kill the seedlings. On *I. paraguayensis* leaves the ill-defined, black, zonate, centrally sunken spots measure 3 to 25 mm. in diameter. *Eucalyptus* seedlings are invaded through the collar, which is girdled and rotted by the dark-coloured lesions of the pathogen. The leaves sometimes bear indefinite, roughly circular, ochraceous-buff spots (grey on *E. cinerea*), 1·5 to 15 mm. in diameter. The juncture of stock and scion is the usual channel of infection on roses, which develop a black discoloration and fissures on the cortex.

C. scoparium was isolated on potato dextrose agar and inoculated into the above-mentioned hosts with positive results (through wounds only in the case of *I. paraguayensis*). The following species of *Eucalyptus* were infected: *E. globulus*, *E. rostrata*, *E. viminalis*, *E. resinosa*, and *E. cinerea*. In cross-inoculation tests the strains from the various hosts were mutually pathogenic.

Demaree (J. B.) & Wilcox (Marguerite S.). **The fungus causing the so-called 'Septoria leaf spot disease' of Raspberry.** —*Phytopathology*, xxxiii. 11, pp. 986–1003, 2 figs., 1943.

The fungus responsible for the so-called '*Septoria*' leaf spot of red and black raspberries prevalent in the United States east of the Rocky Mountains has been known for nearly a century as *S. rubi* Westendorp, and more recently as *Mycosphaerella rubi* (West.) Roark [*R.A.M.*, xvii, p. 190]. To the same organism has been attributed a similar disease of blackberry and dewberry occurring throughout the country. Examination of the type collection of *Cylindrosporium rubi* Ell. & Morg., 1885, showed it to be identical with the common raspberry fungus hitherto known as *S. rubi* West., 1854. The writers' latest investigations have shown the ascigerous stage of the raspberry pathogen to be a *Sphaerulina* which is named *S. rubi* n.sp., while no perfect phase of the blackberry and dewberry fungus could be detected in overwintered foliage.

S. rubi in the previous year's leaves of *Rubus strigosus* is characterized by numerous scattered or gregarious, mostly hypophyllous, erumpent, black, conical, ostiolate-papillate perithecia, 88 to 140 by 86 to 120 μ; and fasciculate, clavate-cylindrical, sessile, curved or straight, aparaphysate asci, 70 to 44·8 by 9·6 to 15 μ, containing eight hyaline, granular, cylindrical, mostly curved, normally 4-,

occasionally 6- to 8-celled ascospores, 32 to 57·6 by 3·5 to 5·8 μ, pointed at both ends. The fungus in its pycnidial state, *Cylindrosporium rubi* Ell. & Morg. (emend.), reported by Zeller (*Plant Dis. Reptr*, xxvi, p. 329, 1942), is the agent of widespread damage to red raspberries in Pennsylvania, producing on living leaves circular to angular, greenish-black, later greyish spots, 1 to 2 or up to 4 to 6 mm. in diameter. The epiphyllous, subepidermal, thin-walled pycnidia measure 58 to 80 by 58 to 121 μ, and the elongated, obclavate, slightly curved to falcate, hyaline, 3- to 9-septate pycnospores, pointed at one end, 32 to 86 by 3 to 4·8 μ. The name *Septoria darrowii* [*R.A.M.*, xvii, p. 828], apparently used by Zeller in describing the raspberry fungus, is regarded by the authors as a synonym of the earlier *C. mali*. From the descriptions it would appear that *S. rubi* B. & C., *S. comitata* J. J. Davis, and all vars. of *S. rubi* as well as *Ascochyta rubi* Lascher, *Rhabdospora ramealis* (Desm. & Rob.) Sacc., and *Sphaerella ligea* Sacc. are all synonyms of *Septoria rubi* West.

The optimum temperature for growth is 27° C. In greenhouse inoculations the raspberry isolates were non-pathogenic to blackberry and dewberry leaves, those from the Lucretia dewberry infected their own host and the Lawton blackberry but not raspberry, while the blackberry strains attacked the same host readily, dewberry with moderate severity, and the raspberry only with difficulty. The isolates, whether regarded as distinct species, physiologic races, or strains, from each of the three hosts, differ morphologically and physiologically among themselves, retaining their separate identity even if capable of infecting another host. The most striking differences were observed between the raspberry and dewberry forms, the blackberry strain being intermediate between the other two.

Pending the availability of more substantial proof of relationship of the leaf-spotting fungi from raspberry, blackberry, and dewberry, it is proposed to retain the binomial *S. rubi* West. (*M. rubi*) for those from the two last-named, *Sphaerulina rubi* n.sp. being restricted to the raspberry.

Reid (R. D.). **Strawberry red core disease. A progress report.**—*Fruitgrower*, xcvii, 2508, pp. 9–10; 2509, pp. 29–30, 1 fig., 1944.

For several seasons strawberry red core [*Phytophthora fragariae*] caused relatively little trouble in Scotland, but in 1943 it again became of major importance and was responsible for heavy losses in many commercial plantations. The resistance of the Auchincruive group of varieties [*R.A.M.*, xx, p. 482], which probably occupy some 75 per cent. of the total area under strawberries in the west of the country, broke down to some extent under the very exacting weather conditions, notably in respect of the saturated condition of the soil induced by the heavy rainfall during the five months from December, 1942, to April, 1943 (18·03 in. on 106 days out of a total of 151 as against 10·64 on 86 days in the corresponding period of 1941–2). A similar observation was made in the United States in respect of the resistant American Aberdeen (*Plant Dis. Reptr*, xxvi, p. 291, 1942). They do, however, continue to crop where other varieties are a complete failure. A large pool of very promising seedlings, mostly derived from American Aberdeen with a considerable admixture of *Fragaria chiloensis* and *F. virginiana*, has been produced for testing and as future breeding material.

Attempts to solve the problem of virus disease in strawberries by breeding from the tolerant *F. chiloensis* gave disappointing results, inasmuch as the few seedlings that fruited satisfactorily proved highly susceptible to *P. fragariae*, and success in this direction cannot be expected in the immediate future.

Wormald (H.). **Nut drop: a disease of cultivated Hazel Nuts.**—*Gdnrs' Chron.*, Ser. 3, cxv, 2980, pp. 60–61, 2 figs., 1944.

Monilia [*Sclerotinia*] *fructigena* was isolated on prune agar from the discoloured

kernels of prematurely fallen cobnuts [*Corylus avellana*] from a farm near Sevenoaks, Kent, submitted for inspection to the East Malling Research Station in July, 1943, and inoculated with positive results into apple and plum fruits. However, since a rot of these fruits was also caused by other fungi from the same samples of nuts, *S. fructigena* cannot be definitely implicated as the primary agent of the disease pending further comparative studies. The diseased nuts showed discoloured, somewhat withered cupules and browning of the shells, particularly at the base. The loss caused to the grower concerned was from 50 to 95 per cent. in recent years, the dropping occurring in July and August. *C. avellana* does not appear to have been previously reported as a host of the brown rot fungus in England, but Sorauer described the disease on hazel nuts in Germany in 1887 (*Z. PflKrankh.*, x, pp. 152–154, 1900), and it has since been observed in Sweden (1911–1912) and Austria (1922). Since cobnuts are almost invariably grown on fruit farms, the possibility of their serving as sources of infection for pome and stone fruits must be borne in mind.

Gorter (G. J. M. A.). **A leaf-spot disease of the Olive.**—*Fmg S. Afr.*, xviii, 212, pp. 795–798, 801, 3 figs., 1943.

Olive trees on the experimental farm at Elsenburg, South Africa, have in recent years suffered from leaf spot (*Cycloconium oleaginum*) [*R.A.M.*, xxi, p. 403] which, by causing serious defoliation, has appreciably reduced yields. The disease, very probably, also occurs in other groves in the western Cape Province. Usually, the symptoms are most conspicuous during spring, just before the trees begin to blossom. A high percentage of the leaves on affected trees then show yellowing, and bear circular green spots, mostly 3 to 5, but sometimes up to 10 mm. in diameter. Close examination of apparently normal leaves often discloses the presence of spots 2 to 5 mm. in diameter, darker green than the surrounding tissue. At a later stage, the centre of such spots, which develop only on the upper surface of the leaves, usually becomes chlorotic. The spots are surrounded by a zone of slightly discoloured tissue about 0·5 mm. wide. The affected leaves quickly become chlorotic, the spots, which remain green, contrasting sharply with the surrounding tissues. The tissue in the spots is occasionally necrotic. In summer, the spots may turn black. Yellowed leaves drop relatively early.

The Mission and Oblizia varieties appear to be very susceptible, while Manzanillo and Sevillano are moderately resistant, and Nevedillo Blanco is strongly so.

Spraying tests so far conducted indicate that good results are obtained by thorough spraying with Bordeaux mixture (4-4-50) early in winter, after the crop has been picked, followed by another treatment (4-4-100) in spring, directly the young leaves develop, and when flowering is almost over. Fallen leaves should be ploughed under. Only resistant varieties should be planted in new groves. The variety, Leccina, imported from South America, is presumably identical with the resistant European variety under this name.

Sen (P. K.). **Further studies on 'black-tip' of the Mango.**—*Sci. & Cult.*, viii, 2, pp. 91–92, 2 figs., 1942.

Further support is lent to the hypothesis that the fumes from brick kilns are responsible for mango 'black tip' by recent experiments at the Fruit Research Station, Sabour, Bihar, India [*R.A.M.*, xxiii, p. 69], which also yielded the following information. In whatever position the fruit is held, the disorder invariably originates at the tip. The discoloration develops exclusively during the period of active growth of the fruits (24th April to 3rd May in 1942). Fruits exposed to the fumes after attaining their full size but still remaining green (14th to 28th May) did not turn black, but tended to mature earlier than the controls.

IRONS (F.). **A laboratory study of crop duster problems.**—*Agric. Engng*, xxiv, 11, pp. 383–384, 3 figs., 3 graphs, 1943.

Economic control of plant diseases and pests on many field crops depends on the efficient performance of the dusting mechanism, problems connected with which have become more troublesome of recent years through the introduction of new combinations of material applicable only with difficulty, while at the same time entomologists and plant pathologists are setting increasingly rigid and exacting standards for the working of the machinery. The results of the writer's laboratory studies on multiple-outlet power dusters indicate that new developments and improvements in design are needed to surmount certain difficulties connected with unreliability and lack of uniformity in feed rate control, distribution, and fractionation.

WAIN (R. L.) & WILKINSON (E. H.). **Studies upon the copper fungicides. VI. The solution of copper from Bordeaux and Burgundy mixtures.**—*Ann. appl. Biol.*, xxx, 4, pp. 379–391, 1 graph, 1943.

Further studies on the copper fungicides [cf. *R.A.M.*, xxii, p. 147] showed that the soluble copper in freshly prepared Bordeaux mixture (4–4–50) was of the order of 7 p.p.m., but on standing in the absence of air this fell to 0·7 p.p.m. after 10 days. The dried deposit on glass plates yielded about 0·5 p.p.m. of copper to water. As alkalinity increased, the soluble copper in freshly prepared Burgundy mixtures fell to a minimum of about 3 p.p.m., and then rose. This was not the case with dried deposits, which yielded consistently less copper to water. The amounts of copper dissolved by water from dried Bordeaux mixture (4 4–50) deposit on leaves of runner beans were slightly greater than those obtained from the same deposit on glass plates.

Suspensions of *Neurospora sitophila* spores and their filtrates dissolved copper from dried Bordeaux mixture (4–4–50) deposit in excess of the amount dissolved by water. Steam sterilization of spore filtrates did not greatly affect their ability to dissolve copper from dried Bordeaux mixture. The temperature at which spores were suspended in water was a factor, though the substances able to dissolve copper were rapidly yielded to water. The nutrient agar on which the fungus was grown influenced the amount of soluble solids in the spore filtrate and the ability of the filtrates to dissolve copper from dried Bordeaux deposit.

Copper, it was found, could only dissolve from dried 4–4–50 Bordeaux deposit by a mechanism involving complex formation. Active substances included amino-, hydroxy-, and certain dicarboxylic acids and their salts, all being possible constituents of spore exudate. Such substances did not appear to be involved in the liberation of soluble copper from this fungicide.

The hypothesis is put forward that copper dissolves from the deposit under the influence of excretions from the spore, and that the cupri-complexes produced provide the means by which soluble copper is transported to the spore wall. Dissociation of these complexes then render possible the removal of the active toxicant by the spore, with the result that any reversible reactions involved are enabled to continue.

PARKER-RHODES (A. F.). **Studies in the mechanism of fungicidal action. VI. Water.**—*Ann. appl. Biol.*, xxx, 4, pp. 372–379, 2 figs., 1943.

In this paper [cf. *R.A.M.*, xxii, p. 101] the author presents a number of theoretical deductions from application of the theory of variability to hydration effects, dealing with the effect on variability of a given population of spores to acid and alkali toxication of varying the isotopic composition of the hydrogen. In the case of acid toxication, variability should decrease with increasing deuterium content, while in that of alkali toxication it should increase. Experimental evidence con-

firmed this. The importance of hydration effects in practice is emphasized, and evidence is adduced that non-toxic electrolytes exert a direct desolvative action on hydrogen-ions.

McCallan (S. E. A.). **Empirical probit weights for dosage-response curves of greenhouse Tomato foliage diseases.** —*Contr. Boyce Thompson Inst.*, xiii, 4, pp. 177–183, 2 graphs, 1943.

This paper is a further contribution to the series on the mathematical interpretation of the method of evaluating fungicides by means of tomato foliage disease tests [*R.A.M.*, xxiii, p. 34]. When the number of infections is expressed as a percentage of the control, there is a linear relation between probit disease and logarithm of dose but orthodox probit weights are not applicable. In the present study probit weighting coefficients were obtained empirically from 431 pairs of replicate tomato plants infected with early [*Alternaria solani*] or late blight [*Phytophthora infestans*]. By the use of the linear regression equation, a highly significant regression coefficient was found between the logarithm of the weight of per cent. disease in replicate plants and the logarithm of the mean per cent. disease. There was no difference between the early and late blight regression coefficients, although the weights for late blight were more than three times as great as those for early blight. The final probit weights (which are shown in a figure and a table) were derived from the per cent. weights by multiplying by the appropriate z^2 value as obtained from a table of ordinates of the normal curve. The maximum weight is approximately at probit 3·8 equivalent to the LD 88. There is little difference within the range LD 80 to 95, but beyond this range the weights diminish with increasing rapidity. It is recommended that in the use of this greenhouse method of testing fungicides, comparisons of dosage for equal response should be made at the LD 95 level.

Quanjer (H. M.). **Phytopathologische terminologie, met speciale bespreking van den begrippen biotrophie, premuniteit en antistoffen.** [Phytopathological terminology, with a special discussion on the concepts biotrophy, premunity, and anti-substances.] —*Tijdschr. PlZiekt.*, xlviii, 1, pp. 1 16. 1942. [Abs. in *Z. PflKrankh.*, liii, 4–7, p. 200, 1943.]

The author associates himself with the endeavours of the Committee on Technical Words of the American Phytopathological Society in the provision of more accurate definitions of the concepts underlying such technical phytopathological terms as 'host', 'susceptibility', 'non-susceptibility', 'resistance', 'disease-escaping', 'sensitivity', 'non-sensitivity', 'tolerance', 'hypersensitivity', 'necrotic abortion', 'pathogen', 'pathogenicity', 'infection', 'infect', 'infectious', 'inoculate', 'infested', and 'infest'. The sense attached to 'disposition', 'masking', 'perthotrophy', 'necrotrophy', 'tryptotrophy', 'mesotrophy', 'subinfection', 'incubation', 'viruliferous', and 'circulation period' is amplified or modified. Innovations in the way of technical terms are 'biotrophy', implying the phase of a parasitic or pathogenic agency during which the disease producer draws its nutriment from the living host cells, and 'premunity', expressing the loss of susceptibility in a plant, after partial or total infection by a virus or parasite, to the particular pathogen in question or a related one. 'Premunity' thus corresponds broadly with Doerr's 'immunity bound to infection'. The definitions are given in Dutch and English.

Aerobiology. —*Publ. Amer. Ass. Advanc. Sci.* 17, vii + 289 pp., 10 pl., 34 figs., 21 diags., 17 graphs, 2 maps, 1942. $4.00.

This symposium on aerobiology contains a number of critical discussions and reviews of the literature on subjects of phytopathological and mycological interest.

They comprise 'The field of extramural aerobiology' by E. C. Stakman (pp. 1–7); 'Air-borne fungus spores as allergens' by O. C. Durham (pp. 32–47, 2 graphs, 2 maps); 'Micro-organisms in the upper air' by B. E. Proctor and B. W. Parker (pp. 48–53); 'Micro-organisms in marine air' by C. E. Zobell (pp. 55–68, 1 fig., 1 graph); 'Local aerial dissemination of plant pathogens' by G. W. Keitt (pp. 69–77); 'Long distance dissemination of plant pathogens' by J. J. Christensen (pp. 78–87); and 'Abiotic and sublethal effects of ultra-violet radiation on micro-organisms' by A. Hollaender (pp. 156–165, 1 diag., 6 graphs). Reference to all the problems under investigation has been made from time to time in this *Review*.

Larter (L. N. H.) & Martyn (E. B.). **A preliminary list of plant diseases in Jamaica.** *Mycol. Pap. Imp. Mycol. Inst.* 8, 16 pp., 1943. 2*s.* 3*d.*

This preliminary list of diseases of economic plants in Jamaica is largely based on information which has accumulated in Departmental records since 1911. The list is arranged alphabetically under the common names with an index of the Latin names of hosts and parasites. Major diseases not so far found in Jamaica are listed in the introductory note.

Measurement of plant diseases in the field. *Trans. Brit. mycol. Soc.*, xxvi, 3 4, pp. 172–173, 1943.

On the basis of experience gained during 1941 and 1942, the Plant Pathology Committee of the British Mycological Society recommends the following methods of recording disease quantitatively in the field [*R.A.M.*, xxii, p. 365]. In the case of virus diseases of potato and sugar beet, where 1 per cent. or less disease is present in a crop, it is usually sufficient to estimate by visual examination according to a table supplied, one affected potato plant in a 12-yd. radius or one sugar beet plant in a 7-yd. radius representing 0 to 0·1 per cent. disease, and one affected potato plant in a 4-yd. radius or one affected sugar beet plant in a 2-yd. radius representing 0·1 to 1 per cent. disease. If more than 1 per cent. disease is present, random samples on each of two diagonal traverses of the field should be taken, five random samples of 50 to 100 plants each being adequate for general survey purposes and twice the number for special objects, such as the certification of crops. The actual method of counting can be left to the individual observer, provided that it is done consistently from the random sampling position.

Cereal smuts, and take-all (*Ophiobolus graminis*), eye spot (*Cercosporella herpotrichoides*), and brown root rot (*Fusarium* spp.) of cereals as far as they cause whiteheads, can all be recorded from the same traverses of the field. Visual estimation may be applied where percentage of disease is low, less than one affected head in 50 sq. yds. representing 0 to 0·01 per cent. disease, less than two affected heads in 1 sq. yd. 0·01 to 1·0 per cent., and more than two heads in the same area above 1 per cent. At higher percentages of disease, counts should be made by taking ten grab samples at random on a zig-zag or diagonal traverse of the crop, each sample containing not less than 20 eared tillers. The stem bases of the 200 or more eared tillers thus collected which show whiteheads should be separated into three groups, according as they are attacked by *O. graminis*, *C. herpotrichoides*, or *Fusarium* spp., and the percentage number of tillers substantially affected calculated for each group. The amount of smut present can be determined from the numbers of ears affected and may also be estimated by counts of suitable samples when the crops are in stock.

Ainsworth (G. C.) & Bisby (G. R.). **A dictionary of the fungi.**—viii + 359 pp., 10 pl., Imperial Mycological Institute, 1943. 20*s.* (or $4.60).

The authors' aim in this work has been to list all the generic names of fungi

(Eumycetes and Myxothallophyta, but excluding bacteria and lichens) which were in use up to the end of 1939, later genera being enumerated in the Supplements to the *Review of Applied Mycology*. A taxonomic position for each genus is indicated, together with the distribution and number of its species. Other features include short accounts of the chief families, orders, and classes of fungi, and of the bacteria and lichens; explanations of mycological terms; the common and scientific names of important fungi; concise biographical statements concerning some of the pioneers of mycological research; and various further points of interest to workers in systematic and applied mycology and plant pathology. In the hope of extending the scope and enhancing the value of the dictionary, the text has been written for the most part in Basic English with the addition of international scientific words.

Chain (E.) & Florey (H. W.). **Penicillin.**— *Endeavour*, iii, 9, pp. 3–14, 2 pl., 1944.

A clear and full account is given in semi-popular terms of the discovery of penicillin and its chemotherapeutic properties. A bibliography of 53 titles is appended.

Penicillin, 1929–1943.—*Brit. med. Bull.*, ii, 1, pp. 1–28, 7 figs., 1944.

This issue contains special contributions by Professor L. P. Garrod (Penicillin: its properties and powers as a therapeutic agent), Professor A. Fleming (The discovery of penicillin) [see preceding abstract], Dr. E. Chain and Professor H. W. Florey (The discovery of the chemotherapeutic properties of penicillin) [see next abstract], Professor A. Fleming (Penicillin for selective culture and for demonstrating bacterial inhibitions), Dr. E. Chain (Other antibacterial substances from bacteria and moulds), and Dr. M. E. Florey (Clinical uses of penicillin), followed by a review of selected papers written between 1929 and 1943, inclusive. Communications on penicillin published abroad are listed in an appendix.

Florey (H. W.). **Penicillin: its development for medical uses.**—*Nature, Lond.*, cliii, 3871, pp. 40–42, 1944.

The development of penicillin research [*R.A.M.*, xxi, p. 248 and preceding abstracts] is traced from the discovery, by Prof. A. Fleming in 1929, of that substance in cultures of *Penicillium notatum* to the work being done at present at the School of Pathology, Oxford.

Young (E. L.). **Studies on Labyrinthula. The etiologic agent of the wasting disease of Eel-grass.**—*Amer. J. Bot.*, xxx, 8, pp. 586–593, 2 figs., 1943.

In cultural studies of the *Labyrinthula* (the identity of which with *L. macrocystis* Cienkowski 1867 was established) [*R.A.M.*, xxi, p. 298] causing wasting disease of *Zostera marina* in Plymouth Harbor, Massachusetts, the author suspended portions of recently invaded host tissue in a hanging drop of Berkfeld filtered sea water on a cover slip supported by a wet cardboard cylinder. On incubation the parasite soon emerged into the water and by storing at 3° C. when not in use, the cultures, though contaminated by bacteria, could be maintained in good condition for at least a week. Both in the host tissue and in culture the parasite appears in its characteristic vegetative stage as a net-plasmodium with a lacy network of filamentous tracks on which the fusiform cell bodies glide. The cell bodies or spindles average 18 by 4 μ, and reproduce by binary fission with a shifting line of cleavage. The glutinous, elastic, fibrillar track is a product of the spindles, which glide along its surface. Nutrition occurs, apparently, by extracellular digestion and absorption of the foodstuffs in solution. Other stages occurring in both host tissue and hanging drop culture are an encysted phase in which individual fusiform cells round up, acquire a tough, opaque wall and presumably act as resting bodies, and a sorus stage in which several to hundreds

of cells encyst, becoming enclosed in a tough, opaque membrane; on germination the membrane breaks, liberating small, globular cells which elongate to the fusiform cells and these reconstitute the net-plasmodium. In hanging drop cultures only, a pseudoplasmodium phase also arises in which the spindles lose their fibrillar track system and mass together.

The optimum temperature range is 14° to 24° C., but viability is retained from 0·3° to 30°. Growth takes place in cultural environments ranging from P_H 4 to 9, while the salinity tolerance is from 0 to over 32 per cent. chlorinity, with an optimum range for parasitism on *Zostera* of about 12 to 22 per cent. chlorinity. The host range includes representatives from the green, brown, and golden algae, and in the Naiadaceae includes *Ruppia* and *Zannichellia*.

As *Zostera* fructifies when the surrounding water is at 18° to 24° and the fungus is most active at 14° to 24°, the host becomes blighted just before propagation. Decrease in salinity round *Zostera* beds would tend to inhibit infection and increase to favour it, since the vegetative stage of *L. macrocystis* is injured more rapidly by decrease than by increase in the salinity of the organism's environment. Observations have confirmed this view. Owing to its wide natural host range, *L. macrocystis* may be omnipresent, waiting but for the ideal ecological or physiological condition to effect invasion.

The six species of *Labyrinthula* so far described are tentatively reduced to three, with two varieties, and it is suggested that further investigation may reduce these to one species.

[In a footnote the author states that a complete account of the *Zostera* wasting epidemic is given in a Thesis for Honors in Biology filed at the Cryptogamic Laboratories, Harvard University.]

Săvulescu (T.). **Plant protection and phytopathological organization in Rumania.** —*Int. Bull. Pl. Prot.*, xvii, 6, pp. 85M–102M, 1943.

In a lecture given at the International Institute of Agriculture in June, 1943, the author described in detail the plant protection and phytopathological services in Rumania, and some of the disease control campaigns carried out during recent years. In particular, reference was made to the barberry eradication compaign against black rust of cereals (*Puccinia graminis*), which caused losses of 60 to 80 per cent. of the crop in 1932 and 1933; the compulsory control of wheat bunt (*Tilletia caries* and *T. foetida* [*R.A.M.*, xxi, p. 279; xxii, p. 14]) by organic mercurial dusts (of which 70 car loads were used in 1942); the establishment of stations for the hot-water treatment of cereals against loose smuts (*Ustilago tritici* and other species); the spray warning service for the control of vine downy mildew [*Plasmopora viticola*: ibid., xviii, p. 782]; the inspection of nurseries; the regulation of the sale of fungicides; and the agricultural information services. In conclusion, the author suggested several problems capable of solution only on an international scale, such as the control of cereal rusts and, in particular, those of wheat; and the preparation of maps showing the geographical distribution of the most important parasites [ibid., xxiii, p. 80].

Ranzi (F.). **Two processes for preserving small animals, herbarium material, phytopathological specimens, etc.**—*Int. Bull. Pl. Prot.*, xvi, 6, pp. 86M–89M, 1 fig., 1942.

The writer has secured excellent preservation of insect and plant (including phytopathological) specimens by enclosure in successive layers of dammar resin [derived from various Pinaceous trees of the genus *Dammara*, especially *D. alba*, in Australasia and the East Indies] or between sheets of cellophane sealed at the edges with an adhesive, the air enclosed being expelled by placing the whole in a press. Application has been made for patents for these processes.

Schaede (R.). **Die pflanzlichen Symbiosen.** [Plant symbioses.]—viii + 172 pp., 153 figs., Jena, G. Fischer, 1943. RM. 10. [Abs. in *Zbl. Bakt.*, Abt. 2, cvi, 1–4, p. 51, 1943.]

Included in this treatise on plant symbioses are sections on the associations between Actinomycetes and *Alnus*, *Casuarina*, *Coriaria*, *Elaeagnus*, *Hippophaë*, and *Myrica* [*R.A.M.*, xviii, p. 335], the mycorrhiza of carbohydrate-autotrophic and -heterotrophic plants, and the fungal symbionts of *Lolium* [ibid., xxii, p. 138].

Rayner (M. C[heveley]). **The use and significance of composts in forestry.**—*Ann. appl. Biol.*, xxx, 4, pp. 397–399, 1943.

Reviewing her investigations into the effect of composts on the growth of forest trees [*R.A.M.*, xxi, p. 298], the author states that her experiments demonstrated conclusively that increased supply of nutrients played a relatively insignificant part in the improved fertility of the Wareham soil induced by the addition of composts. They confirmed the presence of soil substances deleterious to growth, and showed that it was obviated by the addition of compost, though the addition of the equivalent amount of salts had no effect.

The author considers that the striking effects on tree growth brought about by composts on natural soils do not depend to any extent upon the addition of nutrients, but are directly associated with qualitative changes in the humus constituents and with the biological activities related with these. They may also, possibly, be associated with the presence of growth-promoting substances in individual composts or produced in the soil as the result of fungal activation.

Hooker (W. J.), Walker (J. C.), & Smith (F. G.). **Toxicity of beta-phenethylisothiocyanate to certain fungi.**—*Amer. J. Bot.*, xxx, 8, pp. 632–637, 2 graphs, 1943.

In this account of studies on the toxicity of beta-phenethyl isothiocyanate in comparison with allyl isothiocyanate [*R.A.M.*, xix, p. 298] in solution culture to *Aspergillus alliaceus*, *Colletotrichum circinans*, *A. niger*, and *Gibberella saubinetii* [*G. zeae*], and of the toxicity of the former as a vapour to the same fungi, the authors point out that the evaluation of beta-phenethyl isothiocyanate as a toxic agent affecting fungi is important because it is a normal constituent of the roots of certain members of the Cruciferae. Hence it possesses a more immediate importance than allyl isothiocyanate as a possible agent in preventing or impeding invasion by root pathogens.

It was found that of the fungi tested, *A. alliaceus* was least sensitive to both oils, followed in order of increasing sensitivity by *C. circinans*, *A. niger*, and *G. zeae*. There was little difference in the relative toxicity of the two oils in the liquid phase to *C. circinans* and *A. niger*, though the allyl oil was slightly the more toxic of the two to *G. zeae* and much the more so to *A. alliaceus*. The response of the fungi to the vapours of beta-phenethyl isothiocyanate was found to depend upon their degree of tolerance to the oil, only *A. niger* and *G. zeae* being inhibited by partial pressures of oil in equilibrium with aqueous solutions in adequate volume. In the vapour form the allyl oil was many times as toxic as the phenethyl, these differences being, apparently, correlated with differences in the vapour pressure of the two oils.

Cockerham (G.). **The reactions of Potato varieties to viruses X, A, B, and C.**—*Ann. appl. Biol.*, xxx, 4, pp. 338–344, 1 pl., 1943.

In this account of the reactions of 146 potato varieties to graft infection with viruses X, A, B [a strain of X], and C [strain of Y] on a basis of their top-necrotic or non-necrotic symptoms, the author states that a cardinal distinction between potato varieties in their response to these viruses is that some are killed with top necrosis while others produce non-necrotic symptoms. Top necrosis may be

regarded as the index of field immunity from the causal virus, but in the work under review it was taken to indicate that infection of the variety examined had been accomplished. Acceptance of the virus without the production of top necrosis was confirmed in every instance by its recovery on a suitable indicator host; the potato varieties Epicure for virus X, Great Scot for A, Arran Victory for B, and Majestic for C were found most suitable for this purpose. The U.S. seedling 41956 failed to accept viruses X and B in some of the trials, its immunity from them being thus confirmed.

With regard to virus X, it is pointed out that as over 70 per cent. of the total potato acreage in Great Britain is planted with varieties susceptible to X, the total annual loss from the virus is considerable, many varieties being completely permeated with the virus, while most show considerable infection. Susceptible varieties need not preponderate in the agricultural practice of the future, as field immunity from X is inherited as a Mendelian dominant, and no insurmountable difficulties prevent the development of field-immune varieties. The essential genes are available within the range of varieties now cultivated, and only selective reassortment is necessary for their employment to the greatest advantage.

Top necrosis due to virus A differs from that due to virus B in its initial symptoms only. Virus A is widely distributed, and may by itself reduce yields. With X, it is jointly responsible for crinkle. It is aphid-transmissible, but not easily transferred by sap-inoculation. Its economic significance is mainly restricted to areas where aphids are abundant, and where, as a result, leaf roll and virus Y are of greater significance. In Great Britain, over 56 per cent. of the potato acreage is planted to varieties field-immune from A. Apparently, it is of relatively small importance as a factor in disease causation in all but a few commercial varieties, such as Golden Wonder, Catriona, and Immune Ashleaf. In these cases, the problem of disease control arises mainly from the infiltration of virus X into the stocks and not from the spread of A from them.

All the evidence supported the view that virus B is a strain of X. The distribution of B in Great Britain is closely associated with that of X, both being recorded from most varieties susceptible to both. There is no record of B from varieties field-immune from X. The distribution of B is less extensive than that of X, but it is found quite commonly in varieties susceptible to both viruses, which compose 55 per cent. of the potato acreage.

Infection by virus C through sap inoculation with carborundum as an abrasive was accomplished on several occasions. The varieties Epicure, Majestic, British Queen, Up-to-Date, Craigs Defiance, and President, which all show top necrosis when graft-infected, responded to sap inoculation with the formation of local necrotic lesions on the inoculated leaves. With the exception of a single plant of Craigs Defiance, which succumbed with top necrosis, no systemic invasion occurred. Arran Victory, when similarly infected, accepted the virus with the production of a chlorotic crinkle similar to that induced by virus Y on this variety. The similarity of the effect of C and Y on various hosts suggests that either Y is a constant contaminant of C, or that C is so closely allied to Y that it evokes similar host reactions. The evidence, on the whole, supports the second alternative. While the disease induced by C is frequently severe, it appears to be rare.

An appendix is given in which the varieties tested are listed alphabetically, and their reaction to each of the four viruses is shown. Those found field-immune from all four are Benalt, Craigs Defiance, Crusader, Harbinger, and Thorn II.

Bald (J. G.). **Potato virus X: mixtures of strains and the leaf area and yield of infected Potatoes.**—*Bull. Coun. sci. industr. Res. Aust.* 165, 32 pp., 1943. [Photo-lithographed.]

Tests conducted at Canberra over a five-year period to determine the relation

between the yield of Up-to-Date potatoes and the strain mixtures of potato virus X harboured by them afforded proof of an inverse ratio between severity and production. The symptoms induced on potato plants in the greenhouse by inoculation with mixtures containing various proportions of severe and necrotic strains of virus X resembled those resulting from comparable spontaneous infections. The results of inoculations with strain mixtures on *Datura stramonium* suggest that the symptoms caused by virus X on potatoes are mainly due to mixtures containing the necrotic strains in concentrations of less than 50 per cent. A number of the manifestations of infection on *D. stramonium* were tested as indexes of severity, and those based either on the symptom rating or the incubation period or both, are proposed as criteria of virulence.

A small-scale trial with Up-to-Date in 1940–1 demonstrated an inverse ratio between the severity of X mixtures carried by tuber lines and the yields. In the early stages of growth there was no relation between vigour of the haulms and virulence of the mixtures. The results of another test in the same year on 25 tuber lines showed that mixtures of differing severity exerted no effect on the leaf area or growth rate until flowering, while the only indication of an influence of virulence on maturity was that a larger number of plants carrying severe mixtures died off prematurely. In further experiments in 1941–2 differences in yield between tuber lines were found to be highly significant: it was calculated from the regression of yield on severity that a masked strain of X reduced the harvest by about 12 per cent. and the most severe naturally occurring strain mixture by 45 per cent. A test on two lots of Great Scot, one infected with a masked strain of X and the other virus-free revealed no effect of the disease on leaf area at maturity, but again there was a significant reduction of 12 per cent. in yield.

Smith (K. M.). **Studies on the spread of certain plant viruses in the field.**—*Ann. appl. Biol.*, xxx, 4, pp. 345–348, 2 figs., 1943.

In studies on the spread of potato viruses X and Y and cucumber mosaic virus in the field, White Burley tobacco plants were set out in two series of plots, each in the shape of a cross. In the case of potato virus X, the plants in one plot were placed 4 ft. apart and were not in contact, though in the other plot they were only 1 ft. apart, and were in contact. In each of these plots, four X-infected tobacco plants at the centre served as a virus source. A duplicate series was set out to study the spread of virus Y, while a third series with no virus source served as control. No plot was set aside for cucumber mosaic, as it was known that this always appeared.

No spread of virus X was observed in the field, though a glasshouse test demonstrated that it can be passed from diseased to healthy tobacco plants by mechanical contact.

Spread of virus Y, on the other hand, was rapid and complete, but there was no evidence of spread by mechanical contact, as healthy plants were commonly found between two diseased ones. On 20th July, two Y-infected plants were found in the 'spaced' control plot, as compared with 17 in the spaced plot with the virus sources at the centre; on the same date, the contact control plot had 7, and the contact experimental plot 63, infections. It therefore seems clear that close proximity of a source of virus infection was an important factor in spread. By 18th August, the spaced control plot had 32 diseased plants out of 64, and the contact control plot 62 out of 160, compared with nearly 100 per cent. infection in the experimental plots.

Cucumber mosaic reached the plots considerably after the appearance of potato virus Y, presumably because it had to come a greater distance, there being no known source of infection in the immediate vicinity. Once it was present, its

subsequent spread was much slower than that of Y. Transmission by mechanical contact did not appear to take place.

Czerwinski (H.). **Untersuchungen und Beobachtungen über die Blattlaus Myzodes persicae Sulz. als Verbreiter des Kartoffelabbaues auf dem Versuchsfeld des Instituts für Acker- und Pflanzenbau Berlin-Dahlem und dem Versuchsgut Thyrow.** [Investigations and observations on the aphid *Myzodes persicae* Sulz. as a vector of Potato degeneration on the experimental field of the Institute for Agriculture and Plant Organization Berlin-Dahlem and the Thyrow experimental farm.]—*Angew. Bot.*, xxv, 3–4, pp. 201–250, 8 figs., 1943.

An exhaustive, fully tabulated survey is given of investigations carried out from 1938 to 1940, inclusive, to determine the possibility of an etiological connexion between the prevalence of *Myzodes* [*Myzus*] *persicae* and the very variable incidence of potato degeneration on the experimental sites at Berlin-Dahlem (administrative district of Teltow, 40 km. south-west of Berlin) and Thyrow, which was consistently higher in the former than in the latter locality. This discrepancy, which was particularly marked in the first two years of the inquiry, is attributed to the fact that the numbers of peach trees (in which the insects overwinter) per ha. of land under potatoes in Dahlem and Thyrow are 152 and 7, respectively [*R.A.M.*, xxii, p. 268]. With a stationary relative peach population in the experimental areas, the other decisive factor in the infestation of the potato crops is the prevailing mean temperature and humidity during the peak period of aphid development (April to June), the warmer and drier the weather the more intensive being the activity of the insects. Climatic factors tending to reduce aphid reproduction include extremes of temperature, persistent rain, and sudden very heavy showers.

During the exceptionally severe winter of 1939 to 1940, most of the peach trees in the experimental areas died, and *M. persicae* was largely superseded by the sluggish and therefore relatively unimportant *Doralis* [*Aphis*] *rhamni* which seldom migrates from the initially colonized leaves [cf. ibid., xxii, p. 446].

Wingless aphids were observed to be actively motile within a restricted area. Thus, on one day of fine, dry weather, 15 per cent. left the plant on which they originated; of these 53 per cent. had only travelled as far as the immediately contiguous plants on either side. A total of 62 per cent. of the migrating aphids remained in the row containing the plant of origin, 35 per cent. reached the next rows on either side, while only 2 per cent. were counted on the next ones further away. The movement of the insects was promoted by showers and strong winds: it was effected for the most part by crawling from leaf to leaf of neighbouring plants, and to a lesser extent by way of the ground.

Observations on caged plants emphasized the particular virulence of early aphid infestations, which may involve the loss of the entire current season's crop. The yield of plants remaining free from attack until flowering is not reduced, but their progeny may be altogether diseased under unfavourable environmental conditions.

Pal (B. P.). **Virus diseases of Potatoes in India.**—*Curr. Sci.*, xii, 10, p. 279, 1943.

In the opinion of Dr. R. N. Salaman, of the Potato Virus Research Station, Cambridge, tubers of the important commercial Phulwa (Patna White) potato variety submitted to him for inspection in 1938 were affected by potato virus Y. The use of healthy tubers and thorough roguing have been largely successful in the control of the disease at New Delhi. In one test, for instance, the percentages of infected plants arising from (*a*) tubers from apparently sound plants after roguing, (*b*) tubers from a field where roguing was not practised, and (*c*) tubers from diseased plants, 40 days after planting, were 5·2, 9·8, and 16·1, respectively, the corresponding figures for two further counts at monthly intervals being 7·5, 16·8, and 24·9,

and 9·4, 19·8, and 28·2, respectively. In an experiment to determine the effect of dates of planting on the incidence of virus Y, the percentages of diseased plants for plantings of 15th September, 1st and 15th October, and 1st November were 31·3, 35·6, 4·9, and 7·3, respectively. Not all the tubers from an affected plant produced diseased offspring. When single-plant progenies were grown separately, usually only 50 to 60 per cent. of the resulting stand contracted the disease. Darjeeling, Red Round, and other commercial Indian varieties also suffer from virus Y.

The only other virus disease that has been definitely identified on potatoes in India is leaf roll.

Black (W.). **Inheritance of resistance to two strains of blight (Phytophthora infestans de Bary) in Potatoes.**—*Trans. roy. Soc. Edinb.*, lxi, 1, pp. 137–147, 1943.

Two strains of potato late blight (*Phytophthora infestans*) were used in the writer's studies on the inheritance of resistance to the disease at the Scottish Plant Breeding Station, Corstorphine, Edinburgh [*R.A.M.*, xxii, p. 447], viz., the common A and a more virulent physiologic form B arising from the former [ibid., xii, p. 390 *et passim*]. Segregations of resistant and susceptible plants following infection by the two strains have been traced through several generations of hybrids bred from (*a*) *Solanum rybinii* (susceptible), *S. demissum* (resistant), and a number of cultivated varieties of *S. tuberosum* (susceptible), and (*b*) *S. demissum* and *S. tuberosum*, and the data thus obtained suggest that the inheritance of resistance to these physiologic forms is governed by two factors of different phytogenetic origin, designated Ra and Rb, the former conferring resistance to A only and the latter to both A and B. These results are in agreement with published cytological evidence indicating that the species of potato concerned are of hybrid origin, with 6 as the most probable basic chromosome number. The inheritance of resistance to late blight is accordingly explicable on the basis of the allopolyploid character of the species, *S. rybinii* being treated as an allotetraploid, *S. tuberosum* as an allo-octoploid, and *S. demissum* as an allododecaploid.

Starr (G. H.), Cykler (J. F.), & Dunnewalde (T. J.). **The effect of moisture and other factors on Potato scab.**—*Amer. Potato J.*, xx, 11, pp. 279–287, 1 fig., 1943.

In a field experiment carried out in Wyoming in 1942 to ascertain the effect of irrigation practices on the incidence of potato scab (*Actinomyces scabies*), four plots were used, (1) 'general practice', five irrigations at intervals of 6 to 20 days, or a total of 45 in. of net irrigation water, (2) 'minimum soil moisture variation', nine irrigations at intervals of 3 to 8 days, or a total of 60·7 in. of net irrigation water, (3) 'medium soil moisture variation', eight irrigations at intervals of 4 to 12 days, or a total of 47 in. of irrigation water, and (4) 'wide soil moisture variation', four irrigations at intervals of 12 to 18 days, or a total of 11·5 in. of net irrigation water. The 'index numbers' for scab incidence in the four plots, were, respectively, 202, 235, 224, and 203. Thus, most scab developed in those plots that received the most irrigation water.

No significant relation was established between scab incidence and soluble salts, P_H value of soil, lime content, available phosphorus, or potassium.

The yield of the 'wide variation' plot was significantly less than those of the 'general practice' and 'minimum soil moisture variation' plots.

Starr (G. H.). **Ring rot increase in Potato seed lots having known quantities of infection.**—*Amer. Potato J.*, xx, 9, pp. 237–241, 1943.

One-bushel samples of potatoes, each containing a trace of ring rot [*Coryne-*

bacterium sepedonicum], were sent from Maine, Minnesota, Nebraska, New York, and North Dakota to the Wyoming Agricultural Experiment Station, where the extent of increase of infection was determined in the 1942 crops, both by external symptoms and the Gram-stain method [*R.A.M.*, xxi, p. 390].

The number of plants showing symptoms of ring rot in the five lots derived from whole tubers were 0 out of 27 hills, 1 (5 questionable) out of 123, 0 out of 52, 0 out of 22, and 0 (1) out of 72, respectively, the corresponding figures for cut tubers being 0 (3) out of 380, 1 (8) out of 354, 2 (0) out of 467, 1 (5) out of 298, and 1 (12) out of 386, whilst the percentage of ring rot detected by the stain technique were 0, 4·88, 0, 0, and 1·39, and 0·79, 1·41, 1·50, 0·67, and 1·55, respectively. The samples with a trace of disease produced an average of 1·31 per cent. infection in the subsequent crop.

Furthermore, percentages of ring rot ranging from 0·1 to 1 were introduced by means of infected tubers at well-spaced intervals during cutting in five lots of healthy Bliss Triumph seed; one half of each tuber was immersed for 20 minutes in 1 in 500 mercuric chloride and the other half left untreated. The amounts of infection developing in the disinfected and control lots ranged from 0·6 to 2·6 and 1·5 to 18·7 per cent., respectively.

Botanical and Mycological Department. —*Rep. Rubb. Res. Bd, Ceylon, 1942*, pp. 6–11, 1943.

In this report [cf. *R.A.M.*, xxii, p. 274] it is stated that during 1942 weather conditions in Ceylon were unfavourable for the development of *Oidium* leaf disease of rubber [*O. heveae*], but wet weather from June onwards caused a heavy outbreak of secondary leaf fall and pod rot due to *Phytophthora palmivora*. Striking differences were observed in the resistance shown by various clones to the latter fungus.

A small-scale experiment made to investigate various methods of treating stumped buddings before and immediately after transplanting for the avoidance of sun scorch [ibid., xxi, p. 97] and die-back demonstrated conclusively that with good nursery material and careful transplanting stumped buddings can be successfully established in the north-east monsoon planting season.

Teakle (L. J. H.) & Turton (A. G.). **The copper, manganese, and zinc content of the Subterranean Clover and Oats in Western Australia.**—*J. Dep. Agric. W. Aust.*, Ser. 2, xx, 3, pp. 238–259, 1 map, 1943.

A survey of the copper, manganese, and zinc content of subterranean clover [*Trifolium subterraneum*], oats, wheat, and barley, representing soils from a considerable portion of the agricultural parts of Western Australia, showed that copper deficiency [*R.A.M.*, xxii, pp. 37, 246] is general in certain areas. The localities most severely affected are Gingin, Dandaragan, South Busselton, and the south coastal districts. The better-class soils, including loams and clay loams, are usually well supplied with copper, the sandy loams are mostly fairly rich in the metal, but certain classes of the sandy and gravelly types are low in available copper. Manganese deficiency is not general. Zinc deficiency may be present in some light soil types. Lack of these elements may be rectified by their incorporation in the fertilizer mixture.

D[odds] (H. H.). **Sugarcane diseases and insect pests in South Africa. A review of the position. Experiment Station notes.**—*S. Afr. Sug. J.*, xxvii, 8, p. 340; 9, p. 405, 1943.

The virus diseases, streak and mosaic, formerly a source of heavy loss in the South African sugar-cane industry, are stated to have almost entirely disappeared from commercial plantings owing to the establishment of resistant varieties, but

their role as pathogens has to some extent been assumed by fungous diseases, especially red rot [*Colletotrichum falcatum*: *R.A.M.*, xxii, p. 453]. So far, widespread damage has been confined to the Co. 290 and P.O.J. 2725 varieties within the 'mist belt', but recent advice from India that Co. 331 is also susceptible drew attention to some cases of infection on the last-named variety at the Mount Edgecombe Experiment Station, Natal. In September, 1943, *C. falcatum* was further observed for the first time on Co. 464, one of the most promising of the newer Indian varieties, while Co. 453, already attacked in 1942, was again infected, as also were a locally raised seedling, N.Co. 318, two lines derived from Mauritian seed, and the unreleased variety M.P.R. 151 (at Umfolozi).

Eye spot [*Helminthosporium sacchari*], ordinarily of negligible importance, may temporarily assume a destructive form and be hardly recognizable as the same disease. This change in the character of the disease has been twice recorded in South Africa, once on the unreleased variety Co. 419 at the Experiment Station, and once on Co. 290 at Nkwalini.

Seedlings of Hawaiian origin appear to be particularly susceptible to *Fusarium moniliforme* [*Gibberella fujikuroi*: loc. cit.].

Some leaves submitted for examination from Tucumán, Argentina, where streak was suspected, were found to be affected by 'stipple', a common non-infectious type of spotting.

Mungomery (R. W.). **Report of the Division of Entomology and Pathology.** *Rep. Bur. Sug. Exp. Stas Qd, 1942–43*, pp. 18–19, 1943.

In this report on sugar-cane disease work in Queensland during the season 1942-3 [cf. *R.A.M.*, xxii, p. 276] it is stated that gumming disease [*Xanthomonas vasculorum*: loc. cit.] was of little consequence, having disappeared from the southern and central districts, where a few years ago it seriously threatened the sugar industry, and considerably subsided in the north. Following the elimination of fields of susceptible varieties in the Mulgrave area, the only sources of danger are the odd stools of these varieties still present in other plantings. In resistance trials conducted at Brisbane the following varieties showed neither oozing of gum nor dead stalks: Akbar, Atlas, China (Cow cane), C.S.R. 1 (Cow cane), D. 166/34, E.G. 1 (Cow cane), Q. 30, Q. 35, Q. 41, Q. 42, and Q. 813.

Downy mildew [*Sclerospora sacchari*: ibid., xxi, p. 503] was well under control in the Mossman, Hambledon, Mulgrave, and Mackay areas, and there was a further improvement in the Bundaberg area, the number of diseased stools of cane in 1943 averaging 0·055 per acre as compared with 0·074 in 1942.

Fiji disease [loc. cit.] is reported to have increased in the Bundaberg district. Of the 275 farms recorded as diseased in this area since inspection started, 71 are now free from disease, while in the remaining 204 an average of 28 stools per farm was rogued during the season under review. In the Maryborough area, only 390 stools were found in the 5,409 acres inspected and this improvement has permitted the reintroduction of P.O.J. 2878 and M. 1900S. In the Isis area the disease was more prevalent owing largely to the regrettable, but sometimes unavoidable, practice of leaving diseased blocks to stand over. Negligible losses were caused in the Moreton area. The results of resistance trials completed during the year showed Q. 28, Katha, Saretha, *S*[*accharum*] *spontaneum* Tank., and *S. spontaneum* Burma to be highly resistant, while Co. 364 exhibited only a small amount of infection: the Hawaiian canes, 28–4291, 31–2484, 31–2806, and 32–8560, appeared to be highly susceptible; and the standards, D. 1135 and P.O.J. 2878, showed 81 and 71 per cent. infection, respectively.

The usual small amount of leaf scald [*X. albilineans*: ibid., xxi, p. 304] is reported from the far northern districts; in the Mulgrave area the disease was fairly prevalent in Oramboo.

The position with regard to chlorotic streak [loc. cit.] is stated to be unchanged.

Sclerotial leaf disease, usually of very minor importance, caused some deaths in Badila, and in P.O.J. 2878 in the Herbert River district.

Mosaic disease [loc. cit.] attracted some attention during the year by affecting some of the new varieties, namely Q. 25 and Q. 28, and several of the standard canes.

Cross (W. E.). **Declaración referente al 'carbón' de la Caña de Azúcar.** [A statement in reference to Sugar-Cane 'smut'.]—*Circ. Estac. exp. agríc. Tucumán* 120, 4 pp., 1943.

This is a summary of the information set forth in previous publications of the Tucumán (Argentina) Agricultural Experiment Station concerning sugar-cane smut (*Ustilago scitaminea*) [see above, p. 120]. During the last two or three years, especially in 1943, local growers have made extensive use of semi-resistant to practically immune varieties, which it is estimated now occupy roughly half the acreage under sugar-cane, the remainder being planted with the susceptible P.O.J. 36. Assuming that the latter produces a moderate yield, the prospects for the 1944 harvest are reasonably favourable in the absence of exceptionally adverse climatic conditions.

Dade (H. A.). **Colour terminology in biology.**—*Mycol. Pap. Imp. Mycol. Inst.* 6, 21 pp., 4 charts, 1943. 3s. 9d.

While a standard system such as Ridgway's, comprising over 1,100 colours, enables the colours of organisms to be accurately recorded, the common, suggestive Latin names in regular use by biologists are often indefinite, ambiguous, and misapplied. The author therefore proposes the selection and definition of appropriate terms, covering the entire range of Ridgway's classification and maintaining, as far as possible, the classical names of Saccardo's 'Chromotaxia'. To this end the Latin and English names of colours are listed, with necessary amplifications and critical annotations, the range of each name being further shown diagrammatically.

Waksman (S. A.) & Henrici (A. T.). **The nomenclature and classification of the Actinomycetes.**—*J. Bact.*, xlvi, 4, pp. 337–341, 1943.

Waksman's system of classification of the Actinomycetes [*R.A.M.*, xix, p. 617] has been criticized in regard to the designation and position of the anaerobic pathogenic species responsible for human actinomycosis and bovine 'lumpy jaw', which were referred to the genus *Cohnistreptothrix* Pinoy, *Actinomyces* being reserved for the aerobic spore-forming species. The authors have therefore sought to meet at once the objections of critics and the requirements of the Microbiological and Botanical Codes by the following scheme. The restriction of *Actinomyces* to the anaerobic pathogens necessitates the reference of the aerobic non-sporulating Actinomycetes, which multiply by fragmentation of the hyphae into oidia, to *Nocardia* Trevisan 1888, this genus having priority over *Proactinomyces* Jensen 1931 [ibid., xi, p. 602]. Turning to the aerobic species forming apparently endogenous spores in chains on aerial hyphae and not fragmenting into oidia, no valid generic name could be found in the relevant literature for this large group of soil organisms, and *Streptomyces* is therefore proposed as indicating the essential character of the class, with the new combination *S. albus* (Rossi-Doria emend. Krainsky) comb. nov. *Micromonospora* Ørskov is apparently still valid for the accommodation of forms producing single conidia on lateral branches. These two genera constitute the new family Streptomycetaceae.

Bisby (G. R.). **Stachybotrys.**—*Trans. Brit. mycol. Soc.*, xxvi, 3-4, pp. 133–143, 9 figs., 1943.

A brief historical sketch of the genus *Stachybotrys* and its species is given, with descriptions and figures of specimens and cultures. The genus is considered to have two good species. The name *S. atra* Corda may be used for the one common in northern temperate regions, while a second species in warmer areas is interpreted as *S. subsimplex*. Both species are saprophytic, but *S. atra* may cause commercial damage to paper or cloth.

Karling (J. S.). **The life history of Anisolpidium ectocarpii gen. nov. et sp. nov., and a synopsis and classification of other fungi with anteriorly uniflagellate zoospores.**—*Amer. J. Bot.*, xxx, 8, pp. 637–648, 21 figs., 1943.

A new genus *Anisolpidium* is established for fungi with anteriorly uniflagellate spores, the name *A. ectocarpii* being proposed for the type species. All 14 fungi with zoospores of this nature are removed from the Chytridiales and placed in a separate order, the Anisochytridiales, which contains three families (Anisolpidiaceae, Rhizidiomycetaceae, and Hyphochytriaceae), seven genera, and about 14 species, including *Rhizidiomyces apophysatus* Zopf, parasitic on *Saprolegnia ferax* and other species, and *Hyphochytrium catenoides*, weakly parasitic on maize.

Padwick (G. W.) & Merh (J. L.). **Notes on Indian fungi. I.**—*Mycol. Pap. Imp. Mycol. Inst.* 7, 7 pp., 6 figs., 1943.

This series gives information on miscellaneous fungi noted at the Imperial Agricultural Research Institute, New Delhi, and which it is not immediately convenient to include in the groups undergoing critical taxonomic investigations. The present annotated list comprises 13 species collected between 1939 and 1941. *Sphaerotheca lanestris*, originally described by Harkness in *Bull. Calif. Acad. Sci.*, i, p. 40, 1886, on *Quercus agrifolia* and since observed on other species of oaks in America and Japan, was found, for the first time in India, on *Q. incana* (a new host) at Mussoorie, United Provinces. The dense, brownish-white mycelial felt covering the young leaves causes thickening, brittleness, and stunting. The perithecia developing profusely on the lower surfaces of older leaves are spherical to ovoid, dark brown to black, 77 to 98 (average 81) μ in diameter, and furnished with short appendages; the asci are ovoid, apedicellate or at most provided with a basal papilla, 70 to 130 by 46 to 74 (109 by 63) μ, and contain eight spores measuring 13·9 to 20·2 by 12·1 to 18·6 (21 by 15·5) μ.

Coniothyrium arecae n. sp. forms on areca palm leaves in Assam pale green, later brown, elliptical, coalescent lesions, ultimately involving the major part of the surface. The amphigenous pycnidia measure 126 to 188 μ in diameter and the dark spores 4·8 to 7·1 by 2·6 to 4·3 μ.

Hyoscyamus niger in Kashmir is attacked by *Ascochyta kashmiriana*, which produces on both leaf surfaces orbicular, zonate, vinaceous-buff to wood-brown, coalescent spots, up to 10 mm. in diameter. The pycnidia developing sparsely on the upper leaf surface are globose, brown, and measure 85 to 171 (118) μ in diameter, and the spores are subhyaline, cylindrical, uni- or rarely biseptate, 15·3 to 24·9 by 2·1 to 5 (19·2 by 3·8) μ.

Septoria gypsophilae var. *macrospora* n. var. on *Gypsophila cerastioides* at Katarnag, Kashmir, differs from the type species only in its longer spores (23·5 to 32 by 2·5 to 3·2, average 27·6 by 2·8 μ, as against 15 to 25 by 2·5 μ).

Mention may also be made of *Wallrothiella bromeliae* on pineapple leaves (a new record for India) at Dangri, Assam, *Epichloe typhina* on *Brachypodium sylvaticum* (a new host record for India) at Simla, *Septoria apii-graveolentis* on wild celery [*R.A.M.*, xii, p. 196] at Gunderbal, Kashmir, and *Venturia inaequalis* on *Pyrus lanata* (a new host for the pathogen) in Kashmir.

Price (W. C.) & Spencer (E. L.). **Accuracy of the local-lesion method for measuring virus activity, III. The standard deviation of the log-ratio of potencies as a measure of the accuracy of measurement.**—*Amer. J. Bot.*, xxx, 9, pp. 720–735, 1943.

Statistical analyses are given of the data obtained in the authors' experiments on the measurement of the activity of tobacco mosaic, tobacco necrosis, lucerne mosaic, and tobacco ring spot viruses by the numbers of local lesions produced on half leaves of Early Golden Cluster bean plants [*R.A.M.*, xxii, p. 499]. The method of measuring activity involved the comparison of dilutions of a standard virus preparation with an equal number prepared from the test virus and the standard deviation of the estimate was calculated from a complicated equation [which is given]. The results showed that the standard deviations of the estimates generally agreed well with the true errors of the estimates except in the case of lucerne mosaic. For some reason as yet not determined the method was found to be biased for this virus. The results obtained with tobacco mosaic, tobacco necrosis, and tobacco ring spot suggest that the standard deviation gives a reliable measure of the experimental error.

Gerstel (D. U.). **Inheritance in Nicotiana tabacum. XVII. Cytogenetical analysis of glutinosa-type resistance to mosaic disease.**—*Genetics*, xxviii, 6, pp. 533–536, 1943.

In the mosaic-resistant tobacco variety, Holmes Samsoun, a pair of *Nicotiana glutinosa* chromosomes has been substituted for a pair of *N. tabacum*. In hybrids of Holmes Samsoun with Purpurea the *glutinosa* chromosome fails to conjugate with its *tabacum* analogue. The transmission of mosaic resistance parallels distribution of the non-conjunctional pair of chromosomes, demonstrating that one of those carries the factor or factor complex for resistance. In heterozygous plants, in consequence of non-conjunction, some 20 per cent. of female gametes contain the *tabacum*, and a comparable number the *glutinosa* chromosome, the remaining 60 per cent. consisting mainly of 23-chromosome gametes and a few with 25, all being functional. On the male side unbalanced 23- and 25-chromosome gametes very rarely function, so that a 1 : 1 transmission ratio is secured by backcrossing heterozygous plants, which should be used by plant-breeders as pollen parents in the transference of mosaic resistance to other *N. tabacum* varieties.

Dimofte (N.). **Die chemische Zusammensetzung von mosaikkrankem Tabak.** [The chemical composition of mosaic-diseased Tobacco.]—*Bul. Cult. Tutun.*, xxxi, pp. 273–278, 1942. [Rumanian. Abs. in *Chem. Zbl.*, cxiv (ii), 12, p. 1155, 1943.]

In experiments with Virginia tobacco, infection by the mosaic virus was found to increase the total nitrogen and protein contents and to lower those of nicotine, reducing substances, carbohydrates and polyphenol compounds, the Schmuck coefficient, and the benzol- and ether-soluble resins.

Mira (E. A.). **Tobacco varieties resistant to ordinary mosaic.**—*Int. Bull. Pl. Prot.*, xvii, 2, pp. 17M–18M, 1943.

In breeding work carried out since 1933 at the Station for Tobacco Studies, Santiponce, Seville, to obtain tobacco varieties resistant to ordinary mosaic, the Colombian variety Ambalema [*R.A.M.*, xxii, p. 499], known in Spain as Colombia, which is resistant to types of ordinary mosaic and closely related viruses, was crossed with a number of varieties ordinarily grown in Spain, including Valencia Alto, Valencia Bajo, Filipino, Maryland, and Habano. In 1940, a fourth generation was obtained, and it was found that there was no correlation between the development and vigour of the plants and their disease resistance. Only a few plants were

resistant, and these were not the best. The seeds of these were harvested separately. To ascertain whether resistance in these plants was transmitted uniformly to all the progeny, an auxiliary generation was raised under glass, and it was found that of the 28 progeny studied, 17 were uniformly resistant. No seed was kept from this test. A fifth generation was next raised in the open; of the new varieties found to be resistant the following are the most important: hybrid 57A (Colombia × Valencia Alto), hybrid 57B (Colombia × Valencia Alto), and hybrid 60 (Colombia × Filipino). The last-named is considered to be particularly promising, being not only resistant, but giving tobacco of high quality. Further work is in progress.

McKinney (H. H.) & Clayton (E. E.). **Acute and chronic symptoms in Tobacco mosaics.** *Phytopathology*, xxxiii, 11, pp. 1045-1054, 2 figs., 1 diag., 1 graph, 1943.

The studies herein described were concerned chiefly with the succession of symptoms developing in the natural course of a yellow mosaic in tobacco, while some attention was also paid to a similar progression of common mosaic. The hosts used were Samsun (Turkish) tobacco and an F_1 generation of the back-cross *Nicotiana tabacum* × *N. longiflora* × *N. tabacum*, and the viruses used were wild-type common mosaic (*Nicotiana* virus 1) [tobacco mosaic virus], yellow mosaic mutant virus BSY [*R.A.M.*, xxii, p. 500], and a yellow (white) mosaic virus obtained from W. D. Valleau [loc. cit.].

Two major phases, an acute and a chronic, were differentiated, the former characterized by severe chlorosis and/or early death of the diseased tissue, the latter by symptoms which may or may not be obvious, death of the tissues following chlorosis only after a long delay or under more extreme environmental conditions than those required for acute reactions. The contrast between the two phases was much more noticeable in yellow than in ordinary tobacco mosaic, in which the virus proceeds comparatively slowly. This differential rate of movement influences the number of leaves in the acute phase and the time of onset of the typical chronic symptoms. A common acute reaction to midsummer infection by the tobacco mosaic virus is necrosis of the older foliage, designated 'blister' by McMurtrey [ibid., viii, p. 533] and 'burning' by Valleau and Johnson (*Bull. Ky agric. Exp. Sta.* 361, pp. 233-238, 1935). The acute phase of yellow mosaic is divided into five types, lettered A to E, inclusive, which intergrade all expressions tending to form a sequence that seems to parallel the natural growth phases of the developing leaves rather than virus movement with respect to vascular channels in relation to phyllotaxy. The chronic phase is represented by two types, F and G. All the types are described in detail.

It seems evident, from these graduated reactions to the tobacco mosaic virus of leaf tissues of different ages, that natural resistance changes with their growth and development, the type of response being presumably determined by the level of resistance at the moment of infection. The observed resistance of young tissues may be due either to inability to maintain a high level of virus synthesis, or to the presence of some condition tending to retard the movement of the infective principle. In addition to very young material, the tissues of adult foliage show more resistance than those of the intermediate stages of growth.

Western (J. H.) & Stewart (R.). **The effect of a chemical soil sterilizing agent on the subsequent development of Tomato plants.** —*Ann. appl. Biol.*, xxx, 4, pp. 370–372, 1 pl., 1943.

Malformed tomato plants having been received from several growers who had all used the same proprietary soil-sterilizing agent, the essential ingredients of which were ortho-dichlorbenzene and an emulsifying agent of the sulphonated oil type, an experiment was carried out in which Ailsa Craig tomato seeds were

grown in compost (*a*) untreated, (*b*) treated with formalin (2 per cent. solution in water), (*c*) the proprietary material (0·5 per cent. solution), cresylic acid (2·5 per cent. solution), and carbon bisulphide (1·33 per cent.).

Germination, except in the cresylic acid series, was good, the ortho-dichlorbenzene giving a rapid and even germination of 96·5 per cent. In this treatment, no sign of abnormality occurred until seven weeks after planting, when every plant showed distortion of the fifth and sixth leaves. The laminae were reduced and misshapen, often consisting of only a thin band of assimilating tissue bordering the veins. All the leaves above the fifth and sixth were abnormal, and the main stem failed to develop at the normal rate, the plants becoming stunted. Subsequently the new growth was progressively more normal, until, in the uppermost portions of mature plants, complete normality appeared to have been attained in leaf, flower, and fruit. The weight of fruit from abnormal plants, however, was appreciably less than that from the controls, averaging (6 plants) only 5·29 lb. per plant, as against 8·14 lb.

A further experiment demonstrated that the ingredient responsible for the injury was the ortho-dichlorbenzene.

Roberts (F. M.). **Factors influencing infection of the Tomato by Verticillium albo-atrum.**—*Ann. appl. Biol.*, xxx, 4, pp. 327–331, 1943.

In studies on the factors influencing the infection of tomatoes by *Verticillium albo-atrum* [*R.A.M.*, xxii, p. 466], Kondine Red seedlings were raised to about the eight-leaf stage in pots. The experimental containers were wooden flats, which were half-filled with different soils. A layer of a culture of the fungus was spread over the surface of the soil, and the flat was then filled up with the same soil. On the surface of the soil in each flat, six small pots were placed, each containing a healthy plant with roots appearing at the drainage hole. Between spring and late autumn, disease development could frequently be estimated by external symptoms. Wilting, however, was often only transitory. Yellowing of the lower leaves was not a reliable symptom in experiments involving soil deficient in one or more nutrients. In some tests, particularly in those carried out late in the year, some infected plants showed no external symptoms. In these experiments, brown staining of the wood was a moderately reliable indication of infection. In some plants, a reliable symptom of severe infection was an orange-brown external discoloration of some of the roots.

In the first experiment, four different quantities of maize meal-sand inoculum, together with a spore-suspension inoculum, were compared in an organic allotment loam and in this diluted with three times its volume of sand. In the undiluted soil there were in all 20 infections (five in roots only) and in the diluted only 8 (5 in roots only).

In another experiment it was found that soil inoculated immediately after steam sterilization particularly favours infection. If left for re-colonization by other organisms before inoculation, the steamed soil becomes progressively less favourable for infection by the fungus.

When nitrogen was applied to inoculated allotment soil the result suggested that nitrogen starvation tends to confine *V. albo-atrum* to the roots of infected plants.

Further tests in which phosphorus and potassium were applied in addition to nitrogen indicated that phosphate did not influence the incidence of infection, but the figures suggest that potash deficiency may have increased susceptibility. Nitrogen deficiency appears to limit the eventual number of visibly diseased plants, not so much by preventing initial infection from the soil as by retarding fungal development within the vascular tissues. Nitrogen deficiency reduces both the severity of the disease and its incidence.

In a final experiment, the spread of the fungus from the roots of an infected

plant to those of neighbouring healthy plants was expedited by killing the infected plant.

Bailey (L. F.) & McHargue (J. S.). **Copper deficiency in Tomatoes.**—*Amer. J. Bot.*, xxx, 8, pp. 558–563, 2 figs., 1943.

An account is given of symptoms developing in tomato plants grown in culture solutions containing no copper. The optimum copper concentration for top growth was 0·05 p.p.m., and for fruits 0·01 p.p.m. The copper content of copper-starved plants was rather higher, on a basis of unit dry weight, than that of the copper-treated plants. Plants and portions of plants showing severe copper starvation contained relatively large amounts of copper, which was in an immobile state.

Lesley (J. W.) & Lesley (Margaret M.). **A hereditary variegation in Tomatoes.**—*Genetics*, xxvii, 5, pp. 550–560, 2 figs., 3 diags., 1942.

A variegation affecting an occasional tomato plant in field cultures at the Citrus Experiment Station, Riverside, California, is characterized by the superimposition of irregular, pale green areas on normal green stems and leaves. On a predominantly pale shoot, flower development is arrested, while in extreme cases the entire plant is sterile. The variegation was suspected to be of virus origin, but S. P. Doolittle's experiments in its transmission to healthy tomato and tobacco plants by rubbing and grafting gave negative results. The abnormality was found to behave as a dominant character, to be ordinarily inherited through the female parent, and apparently to originate in the cytoplasm.

Colquhoun (T. T.) & McCarthy (D. F.). **The Grand Rapids disease of Tomatoes.**—*J. Dep. Agric. S. Aust.*, xlvi, pp. 310–313, 4 figs., 1943.

Isolations from diseased glasshouse and outdoor tomatoes in South Australia constantly gave *Aplanobacter* [*Corynebacterium*] *michiganense* [*R.A.M.*, xxi, pp. 288, 420]. The control measures recommended consist in using seed from healthy plants, disinfecting with mercuric chloride any seed of uncertain origin, using clean soil for the seed-bed, marking affected plants during pruning and destroying them later on, washing the hands and implements with soap and water if contact with diseased plants during pruning is suspected, destroying plants at the close of the season (and not putting affected plants on the compost heap), and not planting tomatoes for two years in land suspected to be infected. So far the disease has made small headway in South Australia, where it appears to have been recorded in 1924 under the name of bacterial wilt by Samuel [ibid., v, p. 213].

Martínez (J. B.) & Del Cañizo (J.). **Spain. Forest pathology notes.**—*Int. Bull. Pl. Prot.*, xvi, 10, p. 133M, 1942.

During the first six months of 1942, the following were among the important investigations carried out at the Forestry Institute, Madrid. Poplar (*Populus nigra* var. *fastigiata*) groves consisting of five- to seven-year-old trees in the Burgos Province suffered from a die-back of the branches caused by *Dothiorella populnea*, not hitherto recorded from Spain. The mycelium develops in the living bark, and the stromata are fairly common in branches 1 cm. or less in diameter, in association with the saprophyte *Coniothecium radians*, the mycelium of which occupies the rhytidome.

Beeches in the Navarra Provinces were infected by *Hypoxylon coccineum*, *Bispora monilioides*, and *Schizophyllum commune*, the trouble being due to the impracticability of prompt clearance of the cut and decorticated logs, which have to remain for considerable periods on the ground in the forests. As a preventive, application of 15 per cent. zinc chloride to exposed parts on the timber is being made.

Waksman (S. A.) & Bugie (Elizabeth). **Action of antibiotic substances upon Ceratostomella ulmi.**—*Proc. Soc. exp. Biol., N.Y.*, liv, 1, pp. 79–82, 1943.

The results of studies on the fungistatic and fungicidal action of various antibiotic substances on *Ceratostomella ulmi*, the agent of Dutch elm disease, showed actinomycin and clavacin to be strongly inhibitory, penicillin and streptothricin without effect, and fumigacin, hemipyocyanin, and gliotoxin intermediate. The anti-fungal activities of clavacin and more especially of actinomycin, the weaker of the two, could be partially overcome by the addition to the medium of certain nutrients, notably peptone [*R.A.M.*, xxii, p. 219].

Boyce (J. S.). **Host relationships and distribution of conifer rusts in the United States and Canada.**—*Trans. Conn. Acad. Arts Sci.*, xxxv, pp. 329–482, 1943.

A critically annotated list of the rusts affecting conifers in the United States and Canada is preceded by an introductory note in which the writer states that the paper is based on his records of pertinent information relating to this group of fungi and covering the period of 25 years since the publication of the valuable work on the same subject by A. S. Rhoads *et al.* (*Phytopathology*, viii, pp. 309–352, 1918). Under each rust are given the synonymy, literature references, hosts, range, and critical remarks. The present study, which is supplemented by a bibliography of 558 titles, further includes *Gymnosporangium*, omitted from the earlier investigation. A number of exotic conifer rusts have been introduced into North America, in one case at least, that of *Cronartium ribicola* on white pine [*R.A.M.*, xxii, p. 543; xxiii, p. 122], with disastrous results. *C. flaccidum*, an injurious caulicolous parasite of *P. sylvestris* in Europe, was observed once in the uredo stage on Prince Edward Island in 1925, but apparently failed to secure a foothold. It constitutes, however, a potential threat to native hard pines. A third caulicolous rust conveyed to the American continent from Asia is *G. japonicum*, which occurs sporadically on the Pacific Coast. Foliicolous rusts similarly introduced but not generally established in America include *Chrysomyxa abietis*, *Coleosporium senecionis*, and *C. sonchi-arvensis* from Europe and *G. haracanum* from Asia.

The transference of native rusts from one region of North America to another is also fraught with grave risks. For instance, *Cronartium fusiforme* might devastate the hard pines of the west if transported thence from its natural habitat in the south and south-east, while conversely, *C. filamentosum*, indigenous along the Pacific Coast and in the Rocky Mountain regions from Canada to the Mexican boundary, might be similarly destructive to eastern hard pines. The detection of the native foliicolous species, *Coleosporium campanulae*, *G. globosum*, and *G. juniperi-virginianae*, and the caulicolous *G. nelsoni* far from their natural habitats shows the possibilities of such dissemination to be actual.

Rivera (V.). **Observations on Phytophthora cambivora, causal agent of the Chestnut ink disease.**—*Int. Bull. Pl. Prot.*, xvii, 4, pp. 49M–56M, 8 figs., 1943.

Cultural studies on *Phytophthora cambivora*, the cause of chestnut ink disease [*R.A.M.*, xxi, p. 475; xxii, p. 52], on sterilized wood of chestnut and other trees showed that some woods are compatible with the development of the mycelium of the fungus, particularly evaporated beech, beech, and poplar, whereas on others the mycelium will develop only if some specially suitable substance, such as malt, is added; such addition, however, does not induce development on chestnut, though by prolonged culture on chestnut sawdust and malt at 22° C. or more, a restricted growth of mycelium can be induced.

Not only has the wood of the plant most susceptible to the disease an almost inhibitive effect on the mycelium, such as is not possessed by woods of resistant plants, but also the tannic compound produced in the chestnut wood in the

presence of the fungus prevents any pronounced development of mycelium. This interpretation is supported by the fact that whenever appreciable growth occurred on chestnut sawdust with malt, 'ink' production occurred simultaneously with fungal development, while no 'ink' was produced when the mycelium failed to reach a certain degree of development. It is considered that ink production is a defensive reaction, though not usually an effective one.

In contrast with the wood, the cambium of the chestnut constitutes a highly favourable living medium for the growth of *P. cambivora*.

Other experiments demonstrated that the mycelium was devitalized by exposure to a temperature of 56° for 30 minutes or to 41° to 42° for 75 minutes, while growth was stimulated by exposure to the same temperatures for 20 and 60 minutes, respectively.

WILKINS (W. H.). **Studies in the genus Ustulina with special reference to parasitism VI. A brief account of heart rot of Beech (Fagus sylvatica L.) caused by Ustulina.**—*Trans. Brit. mycol. Soc.*, xxvi, 3–4, pp. 169–170, 1 pl., 1943.

A heart rot typical of *Ustulina* [*vulgaris*: *R.A.M.*, xix, p. 497] was observed on a beech tree felled in the Botanical Gardens, Oxford, and on beech trees examined at Blenheim Park, Woodstock, Arundel Park, Sussex, and elsewhere. In the tree at Oxford, the rot extended up the trunk to a height of 12 ft., rendering the timber economically useless. In all the cases of heart rot of beech examined, as in most other heart rots caused by the same fungus, infection invariably took place through the decayed tap-root.

BADCOCK (E. C.). **Methods for obtaining fructifications of wood-rotting fungi in culture.**—*Trans. Brit. mycol. Soc.*, xxvi, 3–4, pp. 127–132, 1 pl., 1 fig., 1943.

Using perfected methods of cultivation, the author induced fructification in 82 out of the 92 species of wood-destroying fungi cultured on a sawdust medium [*R.A.M.*, xxi, p. 176]. In general, the procedure was as follows: a tube packed fairly firmly with the sawdust medium and plugged with cotton wool is placed with its mouth downwards in a wide-mouthed flask, in which there is a wet pad, the space in the neck of the flask around the tube being filled with cotton wool. The entire apparatus is then sterilized in an autoclave for 30 minutes. Through a small hole previously made in the protruding bottom of the tube and kept plugged during sterilization, a transplant of fungus mycelium is now introduced, the small hole replugged and sealed down with plasticine. The mycelium grows along the tube and fructifications usually develop around the mouth of the tube within the flask. This method is stated to be very satisfactory for producing fruit bodies of *Trametes serialis*.

For fungi which do not form mature fruit bodies in the confined space of a flask, possibly owing to the absence of ultra-violet light or too high a humidity, the tube can be carefully removed from the flask as soon as the check in the development of the fruit body becomes apparent. The tube is laid across two Petri dishes, the one near the mouth of the tube being filled with water, and wet pads put both under the fruit body and on the plug of the tube. The water in the dish and the pads must not be allowed to dry out and the cultures should not be exposed to direct sunlight, the best growth being made in strong diffused light.

A more rapid method, involving, however, more risk of contamination, consists in filling large tubes with sawdust medium, autoclaving at 15 lb. pressure for ½ or one hour (according to size), introducing the inoculum through a small glass tube in the large plug, plugging the small tube in turn, and placing the whole in an incubator in which moisture is maintained by the presence of a dish with water. After the mycelium has reached the ends of the tubes, they are removed from the

incubator and placed in the light on Petri dishes in the manner described above. Fruit bodies of *Pleurotus ostreatus* were obtained by this method.

The most rapid method of all is to remove the plugs entirely when the mycelium has grown half way down the tube and then to place a wet pad in the mouth of the tube just out of contact with the medium and later, when surface growth is vigorous, pushing the pad down so as to touch the medium. The tubes with the pads are then placed on Petri dishes containing water in such a position that the light falls on the open mouths of the tubes. When the fruit bodies of Agarics begin to develop it is best to stand the tubes vertically in baskets and to add a little water daily.

No single standard method can be expected to induce fructification in all wood-rotting fungi, but in general the following conditions appear to be essential: the provision of a generous supply of a rich, well-aerated medium with plenty of moisture; moderately high relative humidity, but not a saturated atmosphere, at the surface of the medium and around the developing sporophores; and exposure to light of moderate intensity.

BAVENDAMM (W.). **Über den Einfluss des Darrens von Holz auf seine Pilzanfälligkeit.** [On the influence of the kiln-drying of wood on its susceptibility to fungal infection.]—*Holz Roh- u. Werkstoff*, vi, 5–6, pp. 161–166, 1943.

As in previous investigations along the same lines, the writer found that beech and pine sapwood blocks kiln-dried at 105° C. were equally susceptible with comparable air-dried material to infection by *Coniophora cerebella* [*C. puteana*], *Stereum hirsutum*, *Merulius lacrymans*, *Daedalea quercina*, *Lentinus squamosus*, *Lenzites abietina*, and *Poria vaporaria*. *Polystictus versicolor*, however, constituted an exception to the general rule, being evidently particularly sensitive to the anti-fungal substances (e.g., fatty acids) formed in the process of kiln-drying. It caused 17·6 per cent. loss of weight in the air-dried pine blocks compared with 10·9 in the kiln-dried. Air-dried pine heartwood, on the other hand, was more extensively disorganized than the kiln-dried samples, especially by *P. versicolor*, the loss of weight due to which at the termination of the test after four months amounted to 3·8 per cent. for the former and 1·9 for the latter.

An adverse effect of kiln-drying on fungal growth only sets in at higher temperatures, i.e., 150° for pine and 175° for beech. At 200° the wood disintegrates and is highly resistant to fungal invasion, though the blocks continue to support profuse mycelial growth. At this temperature a faint odour of tar becomes discernible, pointing to the formation of distillates, the protective action of which is well known.

It was ascertained, in connexion with these experiments, that manual tests of the degree of fungal disorganization, which are sometimes impracticable, notably in the case of *S. hirsutum* on beech, may be supplemented by visual observations on the colour and consistency of the infected wood.

SCHULZE (B.). **Einheitliche Begriffsbestimmungen auf dem Holzschutzgebiet.** [Uniform definitions of concepts in the realm of wood preservation.]—*Holz Roh- u. Werkstoff*, vi, 4, pp. 141–142, 1943.

The writer has repeatedly been asked for explanations of certain terms in current use relating to wood preservation, the literature on which, in his opinion, abounds in ambiguities and contradictions. With a view to securing uniformity of interpretation, he therefore proposes the adoption of a number of standardized definitions for the various processes involved in the treatment of wood against insects, fungi, and fire, including osmosis, the application of appropriate preservatives with a colloid adjuvant (paste) to damp wood; live impregnation, the introduction of preservatives (into the wood) by way of the natural sap stream; and sap displace-

ment, the substitution for the sap in the green wood, with its bark still intact, of a preservative solution by means of hydrostatic pressure.

Southam (C. M.) & Ehrlich (J.). **Decay resistance and physical characteristics of wood.**—*J. For.*, xli, 9, pp. 666–673, 1943.

At the School of Forestry, Moscow, Idaho, the authors determined, on the basis of loss of oven-dry weight, the extent of decay caused by *Coniophora puteana*, the agent of a brown, cubical sap rot of peeled poles, on leached heartwood and sapwood and unleached sapwood of western red cedar (*Thuja plicata*) [*R.A.M.*, xxii, p. 159]. Sterilized blocks of uniform dimensions were placed in jars containing malt agar cultures of the fungus, which were incubated at room temperature, with intermittent diffuse illumination, for 6½ months. At the end of this period the mean weight losses for leached heartwood and leached and unleached sapwood were 26±0·96, 12±0·97, and 18±1·1 per cent., respectively. No correlation was apparent between weight loss and specific gravity or ring frequency, or between ring frequency and specific gravity. These data, though admittedly inconclusive, are published as a provisional contribution to the problem of the relationship between the physical properties of wood and decay resistance, further work on which by the writers is impracticable at the present time.

Wallace (J. O.). **N.Z. Resistant Swede.**—*N.Z. J. Agric.*, lxvii, 5, pp. 341, 343, 2 figs., 1943.

The swede variety known in New Zealand as N.Z. Resistant is stated to be highly resistant to club root [*Plasmodiophora brassicae*] and less susceptible than others to wastage following initial infection with dry rot [*Phoma lingam*]. Of Danish origin, this variety was originally marketed under the name Wilhelmsburger Øtofte [*R.A.M.*, vii, p. 758]. Considerable quantities of seed of this late-maturing variety are now available in New Zealand.

Owen (F. V.) & Murphy (A.). **Progress with curly-top resistant varieties of Sugar Beets.**—*Fm Home Sci., Utah*, iv, 1, pp. 13–14, 1943. [Abs. in *Sugar*, xxxviii, 12, pp. 36–37, 1943.]

Sugar beet curly top control in Utah began with the introduction of the U.S. 1 variety, which contributed to some extent to the revival of the beet sugar industry though its bolting tendency and low sugar content were drawbacks to its cultivation. For a few years, U.S. 34 and U.S. 12, derivatives of U.S. 1 [*R.A.M.*, xxii, p. 85], were grown, but they have now been largely superseded by U.S. 22 and U.S. 33, of which the former is the more resistant, while the latter, with its higher sugar content, is preferred for areas of relatively mild infestation. Meanwhile the continued efforts of breeders have resulted in the development of an even more highly resistant line, Improved U.S. 22, seed of which is expected to be available for commercial plantings in 1944. In exacting tests it yielded 6·6 tons of beets compared with 14·3 and 6·3 for U.S. 22 and U.S. 1, respectively. The damage still inflicted even on resistant varieties in seasons of severe infection may be minimized by early planting, liberal manuring, and other appropriate cultural measures.

Schultz (H.). **Untersuchungen über die Fusskrankheit der Ackerbohne.** [Studies on the foot rot of the Broad Bean.]—*Zbl. Bakt.*, Abt. 2, cvi, 1–4, pp. 38–50, 9 figs., 2 graphs, 1943.

Broad beans are not in general particularly susceptible to disease, but appreciable damage may be caused by foot rot, this having been the case, for instance, according to unpublished material of the Biological Institute, in Oldenburg in 1940 and 1941. It is usual to refer to the disease in question as 'foot rot and wilt', but the

two classes of symptoms rarely occur together and the malady should therefore preferably be termed simply 'foot rot'. A superficial resemblance to wilt may sometimes be observed, as for instance in the Dahlem experimental plots in August, 1942, when the foliage of plants inoculated with *Rhizoctonia* and *Pythium* spp. assumed a pale greyish-green, later brown tinge and the leading shoot drooped slightly; many plants died, the lower leaves turning black and shrivelling, while the upper ones showed only apical and marginal discoloration. The brown vascular discoloration, however, which is the typical feature of wilt, was entirely absent. Dark depressions appeared at an early stage on the stem base, and as infection progressed the whole stem tended to shrink, at the same time losing its normal green colour. The orange sporodochia of *Fusarium avenaceum* were frequently detected on the basal lesions. There were fewer pods on diseased than on healthy plants, and in early attacks the flowers fell prematurely; even after flowering infection reduced the yield to a minimum, except when it was delayed until just before ripening, in which case the crop was apparently normal. The roots of diseased plants were invariably more or less damaged, the brown discoloration spreading from the tips right along to the bases of the lateral roots. The host reacts to the invasion of the parasite by the formation of adventitious roots, thereby postponing or occasionally even averting ultimate collapse, though more often the pathogen gains the upper hand, especially under adverse conditions for the plant, such as drought, and proceeds to disorganize the tap-root, finally leaving only the central cylinder intact. In any case, the involvement of the root system is reflected in arrested growth and consequent reduction of yield.

Cultures on vegetable marrow agar from the root tissues of diseased Dahlem plants gave rise exclusively to *R.* and *P.* spp., but out of 11 plants sent from Landsberg (Warthe), seven yielded *R.* [*Corticium*] *solani*, two *F. avenaceum*, one the same fungus in association with *Botrytis cinerea*, and one *P. artotrogus*. Some of the strains of *C. solani* were characterized by a pale mycelium and sparse yellowish sclerotia, and others by a dark-coloured mycelium and typical dark brown sclerotia [*R.A.M.*, xv, p. 24].

Inoculation experiments were conducted in the greenhouse and field with water cultures and in artificially infected soil, using various strains of *C. solani*, *P. debaryanum*, four strains of *P. irregulare*, four of *F. avenaceum*, and single strains of *P. ultimum* and *P. mamillatum*. Positive results were secured with the four first-named fungi, of which *C. solani* is undoubtedly the most virulent pathogen, followed by *F. avenaceum*, *Pythium* being in general less injurious, though it is clear from the literature that certain species or strains of this genus are potential agents of severe infection.

Legislative and administrative measures. Spain.—*Int. Bull. Pl. Prot.*, xvii, 3, pp. 39M–40M, 1943.

By Decree of 19th September, 1942, relative to the manufacture of insecticides, fungicides, and material serving for their application, a central office register for such products has been established at the Phytopathology and Crop Pests Branch of the Spanish Department of Agriculture. Three months after the publication of this Decree, no product can be manufactured, sold, or circulated unless entered in the said register. Foreign products may be imported only if registered beforehand. The sale of phytosanitary products in bulk is prohibited. The products, on sale in ordinary receptacles, will be provided with a guarantee band and label in accordance with the official model, indicating the registration number of the product, the name of the manufacturer, and the chemical composition, the content of useful ingredients also being shown. All advertising matter concerning the usefulness and application of the product will be revised beforehand by the Department of Agriculture.